ENTOMOLOGICAL
SOCIETY OF
BRITISH COLUMBIA

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY of BRITISH COLUMBIA

Volume 43. Issued February 4, 1947

PAGE

MARSHALL & OLDS—The Pear Psylla in British Columbia..... 1
GREGSON—Feeding Periods Prerequisite to the Mating of *Dermacentor andersoni*..... 3
SPENCER—An Unusual Record of the Wharf Borer, *Nacerda melanura*, in Buried Piling at Vancouver, B.C..... 7
SPENCER—The 1945 Status of *Digonochaeta setipennis*, Tachinid Parasite of the European Earwig *Forficula auricularia* Linn. in West Point Grey, Vancouver, B.C..... 8
SPENCER—The Status of *Anobium punctatum*, the Death Watch Beetle, in the Lower Fraser Valley in 1946..... 9
BUCKELL—A List of the Lepidoptera Collected in the Shuswap Lake District of British Columbia by Dr. W. R. Buckell.. 11
LEECH—List of Some *Philonthus* from British Columbia..... 23
FOXLEE—Further Records of Heterocera of the Nelson-Robson-Trail District of British Columbia..... 24
FULTON—Natural Control of the European Pea Moth *Laspeyresia nigricana* on Sumas Prairie, B.C..... 25
GUPPY—Results of a Season's Study of the European Earwig, *Forficula auricularia*..... 28
LEECH—Local Abundance of the Wasps *Chlorion atratum* and *Megastizus unicinctus*..... 32
RICHMOND—Current Trend of the Western Hemlock Looper *(Lambdina f. lugubrosa)* in the Coastal Forest of British Columbia..... 33
WARD—Resume of Infestations and Control of the Colorado Potato Beetle in British Columbia, 1911-1946..... 35
MURRAY—Commercial Application of Phenothiazine for Codling Moth Control..... 37
JONES—Presidential Address..... 38
IN MEMORIAM—William Arthur Dashwood-Jones..... 41
Theodore Albert Moilliet..... 43
Harry Cane..... 45
SCIENTIFIC NOTES.....10, 21, 22, 24, 36, 37, 46
RECENT LITERATURE.....Facing Page 1, and Page 46
NEW MEMBERS.....Facing Page 1

DEDICATED TO RESEARCH

RECENTLY this doorway to the Whitemarsh Research Laboratories officially opened, and the new home of Penn Salt's Research and Development Department was formally dedicated.

Here will be continued the important work of Penn Salt's rapidly growing staff of chemists, engineers and other technologists. With greatly enlarged facilities, they will be well-equipped to bear a substantial share of the increased responsibility imposed on industry and agriculture by wartime's fast changing economy. Materials, not even dreamed of yesterday, already have become commonplace. And still more remarkable things are in store for the world of tomorrow.

This great building symbolizes the transformation that is taking place in the field of practical research.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
1850 *Chemicals* 1946
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

NEW YORK · CHICAGO · ST. LOUIS · PITTSBURGH · CINCINNATI · MINNEAPOLIS
WYANDOTTE · TACOMA

FORWARD TO A BETTER FUTURE WITH RESEARCH

PENN SALT PROUUCTS ENTER INTO THE MANUFACTURE OF CHEMICALS FOR AGRICULTURE, WATER AND SEWAGE, METAL INDUSTRIES, CERAMICS, GLASS, OIL REFINING, PULP AND PAPER, TEXTILES, LEATHERS, LAUNDRY AND DRY CLEANING, AVIATION GASOLINE.

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY *of* BRITISH COLUMBIA

Volume **43.** Issued February 4, 1947

PAGE

MARSHALL & OLDS—The Pear Psylla in British Columbia..... 1
GREGSON—Feeding Periods Prerequisite to the Mating of *Dermacentor andersoni*..... 3
SPENCER—An Unusual Record of the Wharf Borer, *Nacerda melanura*, in Buried Piling at Vancouver, B.C..... 7
SPENCER—The 1945 Status of *Digonochaeta setipennis*, Tachinid Parasite of the European Earwig *Forficula auricularia* Linn. in West Point Grey, Vancouver, B.C..... 8
SPENCER—The Status of *Anobium punctatum*, the Death Watch Beetle, in the Lower Fraser Valley in 1946..... 9
BUCKELL—A List of the Lepidoptera Collected in the Shuswap Lake District of British Columbia by Dr. W. R. Buckell.. 11
LEECH—List of Some *Philonthus* from British Columbia..... 23
FOXLEE—Further Records of Heterocera of the Nelson-Robson-Trail District of British Columbia..... 24
FULTON—Natural Control of the European Pea Moth *Laspeyresia nigricana* on Sumas Prairie, B.C..... 25
GUPPY—Results of a Season's Study of the European Earwig, *Forficula auricularia* 28
LEECH—Local Abundance of the Wasps *Chlorion atratum* and *Megastizus unicinctus* 32
RICHMOND—Current Trend of the Western Hemlock Looper *(Lambdina f. lugubrosa)* in the Coastal Forest of British Columbia 33
WARD—Resume of Infestations and Control of the Colorado Potato Beetle in British Columbia, 1911-1946..... 35
MURRAY—Commercial Application of Phenothiazine for Codling Moth Control..... 37
JONES—Presidential Address..... 38
IN MEMORIAM—William Arthur Dashwood-Jones..... 41
Theodore Albert Moilliet..... 43
Harry Cane..... 45
SCIENTIFIC NOTES.....10, 21, 22, 24, 36, 37, 46
RECENT LITERATURE.....Facing Page 1, and Page 46
NEW MEMBERS.....Facing Page 1

DIRECTORS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA 1946 - 1947

Honorary President
A. W. FINLAY, New Westminster, B.C.
President
G. R. HOPPING, Vernon, B.C.
Vice-President (Coast)
M. H. HATCH, University of Washington, Seattle, Wash.
Vice-President (Interior)
J. D. GREGSON, Kamloops, B.C.
Hon. Secretary-Treasurer
H. B. LEECH, Vernon, B.C.
Hon. Auditor
W. G. MATHERS, Vernon, B.C.
Advisory Board
H. ANDISON, Victoria, B.C. G. P. HOLLAND, Kamloops, B.C.
J. R. J. LLEWELLYN JONES, Cobble Hill, B.C.
J. MARSHALL, Summerland, B.C. G. T. MOCKRIDGE, CLOVERDALE, B.C.

RECENT LITERATURE

TENTHREDINOIDEA OF SOUTH-EASTERN ASIA WITH A GENERAL ZOOGEOGRAPHICAL REVIEW. By Rene Malaise. Entomological Results from the Swedish Expedition 1934 to Burma and British India. Hymenoptera: Tenthredinoidea. Part I. Subfamily Tenthredininae. Opuscula Entomologica, Supplementum IV. p. iv+1-288, 57 text figs., 20 plates. Lund, 1945. —The first 90 pages of this paper are of great interest to zoologists and botanists, and to entomologists in particular. Under the title "Late Tertiary Geographical Changes as Base of Recent Zoogeography", a fundamental review with 17 figures is given. Wegener's "Drift Theory" is rejected, but much attention is given to Odhner's "Constriction Theory", the latter apparently almost unknown outside Sweden.

The discussion of past land bridges and climates, and of the submarine topography of the oceans, are of broad interest to entomologists. Of immediate value to hymenopterists are the sections on ecology, general affinities and zoogeography, and classification. There are illustrated keys (world fauna) to the Superfamilies of Hymenoptera Symphyta, the Families of the Tenthredinoidea, and the Subfamilies of the Tenthredinidae. On p. 14 is proposed **Eopachylosticta**, new generic name for the fossil sawfly **Amasis byrami** Cockerell. Dr. Malaise is at the Sweidsh Museum of Natural History, Stockholm 50.—H. B. L.

THE BUTTERFLIES OF WASHINGTON. By Ben V. Leighton. University of Washington Publications in Biology, 9 (2):47-63. Seattle, November, 1946. Price 45 cents.—The first part cites the collections and literature on which the list is based, gives notes on the life cycles and economic importance of butterflies, tells where and when to collect in Washington, and tabulates the location and elevation of certain localities. The list proper includes 143 species and 81 varieties; for each is given: the scientific and common name, reference to a published figure or other account, a list of localities and a symbol reference to the collections studied.—H. B. L.

THE NORTH AMERICAN CLEAR-WING MOTHS OF THE FAMILY AEGERIIDAE. By George P. Engelhardt. U. S. Nat. Museum Bul. 190. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. Price 75 cents.—This posthumous work of 222 pages contains 16 black and white plates showing wing venation and male and female genitalia, and 16 plates in full color illustrating most of the species. Seven new generic names are proposed. There is a key to the groups, based on antennae and male genitalia, a key to the North American genera, and in certain cases keys to the species and forms. Each genus and species is taxonomically described, with remarks on the synonymy, distribution, hosts, habits and economic importance. Thirteen species are recorded as from British Columbia, and the distribution of at least 6 others suggest that they will be found along the southern edge of the Province. An outstanding feature of this publication is the full listing of host plants, the results of 40 years of patient investigation by George Engelhardt and a few enthusiastic friends. Entomologists are indebted to his widow and son who have borne the entire cost of engraving and printing the colored plates, from drawings by Mrs. Wm. Beutenmuller and Mrs. M. F. Benson.—H. B. L.

NEW MEMBERS

Elected at the 45th Annual Meeting, February 23, 1946.

Ansell, Charles H.—Ansell Laboratories, Vernon, B.C.
Farris, Sinclair H.—Forest Insect Lab., Vernon, B.C.
Fender, Kenneth M.—Route 3, McMinnville, Oregon.
Godfrey, Langford M.—Agricultural Chemicals Div., C.I.L., New Westminster, B.C.
Hammer, E. Leslie—P.O. Box 339, Port Alberni, B.C.
King, Kenneth M.—Dominion Entomological Lab., Parliament Buildings, Victoria, B.C.
Nielsen, Axel H.—Kinnaird, B.C.
Parish, G. P.—McDonald & Wilson Ltd., Vancouver, B.C.
Richmond, Hector A.—Dominion Forest Insect Lab., 311 P.O. Bldg., Victoria, B.C.

THE PEAR PSYLLA IN BRITISH COLUMBIA *

James Marshall
Dominion Entomological Laboratory, Summerland, B.C.
and
H. F. Olds
Dominion Plant Inspection Office, Vancouver, B.C.

Discovery of Infestations. — The first British Columbia record of the pear psylla *Psylla pyricola* Foerst., was that of Treherne[1] who reported it from Nelson in 1918. Despite extensive scouting and trapping, however, the insect has not been taken in the Kootenay Valley since that time. Possibly this early record was a case of misidentification.

In 1939 discovery of the pear psylla in the Spokane Valley of Washington raised fears for the pear industries of the western states. Shortly after, operations were incepted by the United States Bureau of Entomology and Plant Quarantine with the object of eradicating the infestation. Concurrently, extensive scouting operations were undertaken which, with the sanction and assistance of the Dominion and Provincial Departments of Agriculture, soon carried into the fruit-growing districts of British Columbia.

Within a few years the pear psylla was found in localities far from the Spokane Valley and in 1942 captures were made in an orchard near Oliver in the Okanagan Valley of British Columbia. Rechecking indicated that in all likelihood the insect was generally distributed from Vaseaux Lake to the International Boundary in the Okanagan Valley and in the Keremeos-Cawston district of the Similkameen Valley twenty miles to the west. At that time the area known to be infested included some 500 acres of pear orchard containing approximately 50,000 trees. In order to protect their eradication operations in the neighboring state of Washington, the United States authorities undertook to bring spray equipment across the border, and the spring of 1943 thus saw a considerable number of United States Government spray crews operating in Canadian orchards.

By the fall of 1943 it was evident that three applications of nicotine sulphate—soap or nicotine sulphate—summer oil-soap had given excellent control of the psylla, but, as was anticipated, had not eradicated it. The same year, captures were made as far north as Penticton, so control operations were extended. Once again, however, the spray treatments served merely to reduce psylla populations with the result that in the fall of 1944, in addition to new records from Summerland, recurring infestations were detected in the sprayed areas. These new records, augmented later by others near Peachland and Westbank, brought about such further extension of control activities that in 1945 a fleet of United States power sprayers was operating up to the Westbank district some 75 miles north of the International Boundary. By this time, extensive scouting had included virtually all pear orchards in the Province and at the end of the season had provided evidence of the existence of the pear psylla north to Vernon, east to Midway, and west to Hedley. For practical purposes, therefore, the insect may now be considered generally distributed wherever pears are grown over an area of about 4,500 square miles in the province of British Columbia.

The methods of spread of the pear psylla are not entirely clear. Doubtless its dispersal is aided by air currents since it is a small insect given to flight when adult. It is not uncommonly observed on the clothing of individuals who have passed through infested orchards, so that the

* Contribution No. 2408, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

1 Treherne, R. C. (1918). Annual Report to the Dominion Entomologist (typewritten) Page 2.

great amount of travel between pear orchards incident to their inspection may possibly have accelerated spread of the insect. Unquestionably, however, if the pear psylla is capable of persisting in British Columbia it will merely be a matter of time until it is present in all pear orchards regardless of scouting or inspection operations.

EXPERIMENTS IN CHEMICAL CONTROL[2].—Upon discovery of the first widespread infestation at Oliver, it seemed obvious that with known control measures, eradication of the insect in British Columbia was out of the question. This view was expressed at the outset by W. A. Ross, Chief of the Fruit Insects Unit, Dominion Division of Entomology, who has had long acquaintance with the habits of the pear psylla and whose investigations on its control had led to utilization of heavy dormant oil as standard control practice in Ontario. (The effectiveness of this procedure depends primarily on the fact that heavy oil inhibits oviposition.) Three considerations justified the conclusion that the pear psylla probably would not prove a serious menace to the British Columbia orchardist; first, even in Ontario where environmental conditions are generally favourable for its multiplication, control of pear psylla is not difficult if spraying is timely and thorough; second, there were grounds for hoping that since the psylla thrives best in conditions of poor air drainage and fairly high humidity, it might not prove to be generally prolific under the arid or semi-arid conditions of the British Columbia interior fruit belt. In the third place, although no investigations on control had been carried out in Western North America, there was little doubt that in addition to the known effectiveness of heavy dormant oil, which incidentally is also highly effective against San Jose scale, a summer spray schedule could be developed for simultaneous control of pear psylla and codling moth.

In 1942 an orchard near Oliver, considered at that time to be the most heavily infested in the West, was selected for experiments in chemical control of pear psylla under arid conditions. As the Oliver district, with an average annual precipitation of only nine inches, frequently experiences temperatures in excess of 100° F., the check plot that did not receive any pear psylla spray treatment was of particular interest. Results of the work were: (1) Nicotine sulphate 40% 1 pint—summer oil (79 S.S.U. Vis. 100° F., 73% U.R.) 1 gal.—soap (laundry type) 1 lb., gave effective control. (2) Nicotine alkaloid 40% 1 pint—summer oil 1 gal.—VATSOL K (dioctyl sodium sulphosuccinate 33%) 1 lb., appeared approximately as effective as the nicotine sulphate mixture. (3) Derris concentrate (VISKO D-40 containing rotenone 1%, petroleum 43 S.S.U. Vis. 92% U.R., 33% pine oil, concentration unknown and a mutual solvent, composition and quantity unknown) 1 pint—summer oil 1 gal.—VATSOL K 1 lb., was comparable in toxicity to the nicotine-oil mixtures but less offensive to handle and lower in cost. (4) Pear psylla infestation on unsprayed check trees decreased markedly following a week with maximum temperatures ranging from 95° to 105° F. (5) Unsprayed trees did not show any measurable loss of crop, although some foliage injury was evident.

The investigation was continued in the same orchard in 1943. With the object of developing a grower's spray schedule, only two treatments were applied, each to an area of about two acres. By the end of the season few psyllids were present even on the check trees that neither in 1942 nor in 1943 had received a psylla spray. Evidently by substituting nicotine sulphate-summer oil for the regular first and second codling moth cover sprays of lead arsenate or cryolite, or by adding derris-oil mixture to lead arsenate or cryolite, control of pear psylla could, if necessary, be accomplished at no great extra cost and without additional labour. With this information on hand, investigation of summer control of pear psylla was discontinued

2 Investigation of control methods was done jointly with Messrs. Ben Hoy and R. P. Murray of the British Columbia Department of Agriculture.

until the advent of DDT, when psylla was included in the list of test insects for that compound. Experiments in Kaleden in 1945 indicated fairly clearly that in stove oil solution DDT, per unit weight of toxicant, is less effective against pear psylla than nicotine sulphate applied with summer oil and soap.

In order to utilize the Ontario recommendation of dormant oil, investigations on the effects of various petroleum fractions on orchard trees were begun in 1942. Since the time when dormant oil first became generally used in British Columbia, it had been felt that light oil of 100-110 S.S.U. viscosity at 100° F. was less likely to cause tree injury than a heavier oil of, for example, 200-220 S.S.U. viscosity as used in Ontario against pear psylla. There appears to have been little experimental evidence to support such a view. On the contrary, four years' experiments have indicated that under British Columbia conditions the heavy "psylla" oil is less likely to cause injury to pear or apple trees than its lighter counterpart.

WHAT OF THE FUTURE?—There is every indication the pear psylla is in British Columbia to stay. It is very unlikely that high temperature with low humidity will prove sufficient to eradicate it, since in many irrigated orchards there are potholes or close plantings with poor air drainage and consequently fairly high humidity. Furthermore, it is improbable that growers will take special steps to control it unless so forced by its activities. That would not be efficient orcharding; nor would it be human nature. Rather, from the standpoint of difficulty of control, the pear psylla in all likelihood will be classed with the aphids and treated accordingly. Should the insect flourish in this Province, adequate commercial control may be attained by addition of derris concentrate, for example, to one or two codling moth sprays. This would require a total outlay of five to ten dollars per acre of pear trees but no extra labour. If control of scale insects becomes necessary, simultaneous control of psylla can be effected by applying a heavy dormant oil scale spray somewhat earlier than usual. In that case there would be neither extra outlay nor extra labour. The pear psylla is certainly an unwelcome immigrant, but British Columbia fruit growers will doubtless learn to live with it at no great financial loss or inconvenience.

FEEDING PERIODS PREREQUISITE TO THE MATING OF DERMACENTOR ANDERSONI (Acarina)[1]

J. D. GREGSON
Livestock Insect Laboratory, Kamloops, B.C.

In a previous paper (Gregson[2]) the author mentioned that the feeding rates of female *D. andersoni* Stiles were substantially increased by the presence of male ticks. The experiments described in the present article were planned to demonstrate whether or not copulation is necessary to promote this stimulated feeding, and, since this species of tick only mates while feeding, to determine if any initial engorging period is necessary before this act will take place.

EXPERIMENT A

On April 4, 1945, five capsules, each containing about half a dozen male and female *D. andersoni* were attached to a sheep in the manner described by the author[3]. The males were moved successively from these capusules as indicated in the following table. Another capsule containing females only, served as the control.

[1] Contribution No. 2409, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

[2] Gregson, J. D., 1944. The influence of fertility on the feeding rate of the female of the wood tick, Dermacentor andersoni Stiles. Ent. Soc. Ont., 74th Ann. Rept. (1943), 74:46-47; figs. 1-4.

[3] Gregson, J. D., 1942. Notes on the laboratory rearing of some Canadian ticks (Acarina). Ent. Soc. Brit. Columbia, Proc. 39:32-35.

TABLE I
Experiment A.—Dates of removal of male ticks from each capsule. Host infested with both sexes of ticks on April 24, 1945.

Cap. No.	Apr. 25	Apr. 26	Apr. 27	Apr. 28	Apr. 29
1	x				
2		x			
3			x		
4				x	
5					x
6	Control. Females only.				

On May 1, at the end of seven days' feeding, the surviving females were removed, weighed and photographed. They were then set aside in oviposition tubes until October 1, when the fertility of the eggs produced was checked.

DISCUSSION. The only females which fed rapidly were those with which males had been left until the sixth day. These were also the only ones to lay fertile eggs. This appears to demonstrate that one or both sexes must feed for at least six days before copulation and subsequent acceleration in feeding can take place.

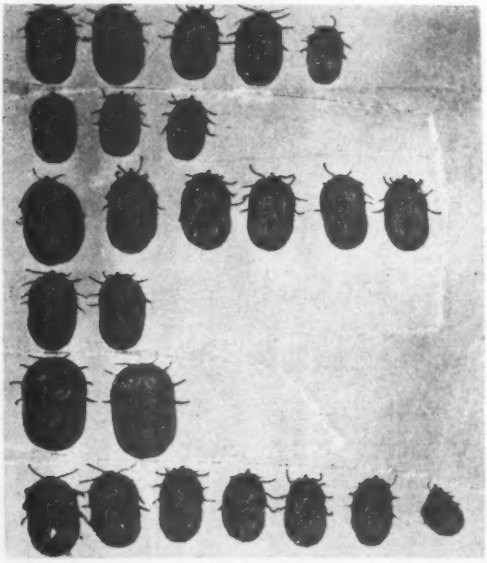
EXPERIMENT B

This experiment was performed simultaneously with the preceding one. Six capsules as before, but containing only females, were attached to a sheep. Males were added to five of the capusules of females at such intervals that the males of each successive group would be deprived of an additional day's feeding by the time the females were removed. In this way it was hoped that it could be shown whether male ticks require a feeding period prior to copulation.

On the eighth day only the females accompanied by males that had had the opportunity to engorge for a six day period were fully engorged.

Fertile eggs were subsequently laid by all these females, but by only two of the five females accompanied by males that had fed for five days. All the remaining females fed slowly and laid eggs which later proved to be sterile.

TABLE II
Experiment A.—State of female ticks from capsules 1 to 6 on May 1. (See Table I.)

Capsule No.		Average weight in grams of females in each group	Fertility of egg masses October 1, 1945
1.		0.209	All sterile
2.		.145	All sterile
3.		.238	All sterile
4.		.227	All sterile
5.		.667	All fertile
6.		.198	All sterile[1]

1 Control. No males present.

TABLE III

Experiment B.—Dates on which male ticks were added to each capsule. Host infested with females only on April 24, 1945.

Cap. No.	Apr. 25	Apr. 26	Apr. 27	Apr. 28	Apr. 29
1.	x				
2		x			
3			x		
4				x	
5					x
6	Control. Females only.				

DISCUSSION. The experiment appears to demonstrate that the males must feed for at least five days before they will mate with feeding females.

EXPERIMENT C

The preliminary feeding period necessary for male sexual activity having been noted, it remained to be shown if a similar period was necessary before the female became in a receptive condition.

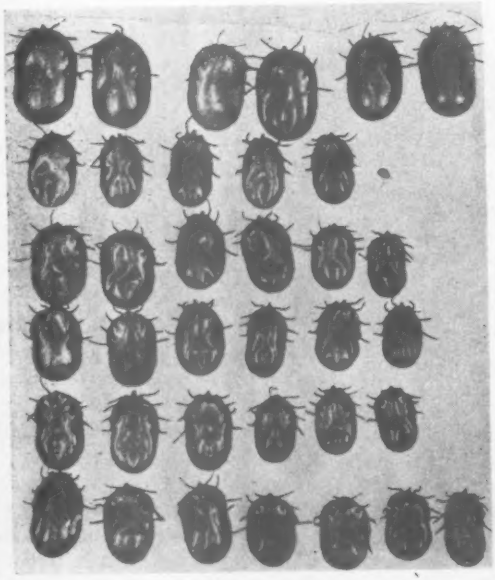
On May 7 a series of males was allowed to feed on a sheep. By May 14 it was assumed that all had fed sufficiently to mate, and at this date they were added to equal numbers of unfed females which were distributed under four capsules on a sheep. The males were then removed at daily intervals from each successive group. The fifth capsule contained females only as a control.

By May 19 some of the females were already engorged and dropping. Thus two days less were required than for the shortest feeding period during the preceding month. To illustrate the maximum contract in feeding, the entire series was removed at this date, the fifth day after infestation.

DISCUSSION. — The experiment illustrated clearly that engorgement in five days is possible if females are mated with prefed males. In this experiment, all females

TABLE IV

Experiment B.—State of female ticks from capsules 1 to 6 on May 1. (See Table III.)

Capsule No.		Average weight in grams of females in each group	Fertility of egg masses. October 1, 1945
1.		0.559	All fertile
2.		.196	2 fertile 3 sterile
3.		.264	All sterile
4.		.237	All sterile
5.		.200	All sterile
6.		.255	All sterile[1]

1 Control. No males present.

TABLE V

Experiment C.—Dates of addition and removal of male ticks from each capsule. Host infested with females on May 14, 1945.

Cap. No.	May 14	May 15	May 16	May 17	May 19
1	x [1]				1 detached
2		x [1]			2 detached
3		x [1]			4 detached
4			x [1]		2 detached
5	Control. Females only.				0 detached

[1] All males pre-fed.

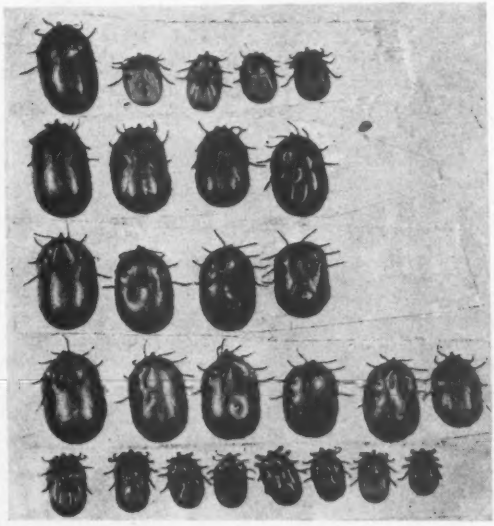
fed rapidly with the exception of those of the control, where there were no males, and group one, in which the males were removed within a day of being placed with the females. In this group only one of the five females fed rapidly. As with the other experiments, the eggs of all the rapidly feeding ticks were fertile.

On May 20, an additional experiment was carried out to support this supposition that a brief feeding period is necessary before the female tick will mate. Two prefed males of the above stock were placed with two unfed females for three days, after which time the females only were placed on a sheep. At the end of five days they had become only half engorged, and so presumably had not mated prior to feeding. These results, and the fact that only one of the five ticks of group 1 of Experiment C engorged rapidly, suggests that one day is the minimum feeding period needed to produce sexual maturity in the female tick. The longer feeding period necessary in the case of the male appears to be taken care of in nature by the earlier activity and appearance of the male at the commencement of the tick season.

SUMMARY.—Experiments involving the feeding of *Dermacentor andersoni* ticks on sheep were designed to illustrate that a preliminary feeding period for both sexes is necessary before this species of tick will mate. It is shown that males require a minimum feeding period of five days, and females, one day.

TABLE VI

Experiment C.—State of female ticks from capsules 1 to 5 on May 19. (See Table V.)

Capsule No.		Average weight in grams of females in each group	Fertility of egg masses, October 1, 1945
1.		0.179	1 fertile 4 sterile
2.		.446	All fertile
3.		.471	All fertile
4.		.427	All fertile
5.		.72	All sterile [1]

[1] Control. No males present.

AN UNUSUAL RECORD OF THE WHARF BORER, NACERDA MELANURA, IN BURIED PILING AT VANCOUVER, BRITISH COLUMBIA.

(Coleoptera: Oedemeridae)

G. J. Spencer
Department of Zoology, University of British Columbia, Vancouver, B.C.

In October, 1945, three beetle grubs were brought to me with the enquiry as to whether or not they were teredos and would prove of potential damage to new piling. They were found in old piling at the British Columbia Sugar Refinery at the edge of tidewater and were uncovered during excavations for a new powerhouse. It was reported that they had been taken from piling that had been covered for thirty years. They turned out to be the larvae of *Nacerda melanura* (Linn.) the wharf borer.

Finding it hard to believe the details that accompanied them, I hastened down to the refinery and interviewed the engineer in charge of construction, who kindly showed me the situation. Between us, we dug out a number of larvae from thoroughly soggy piling in which the centre only was of firm though very wet wood. Tunnels were all through both rotten and firm wood: no pupae were found. To my astonishment, I found that the report sent up to me was true and was only part of the story. The beetle grubs occurred in piling that had been driven thirty years ago into an area of the sea that had been filled in five years previously with furnace ashes and earth; more ashes had been dumped around and on top of the piles and on this foundation, concrete had been poured for a depth of from one to three feet to provide the floor for the erecting and sandblast shops. The heavy buildings had been torn down less than two weeks before my visit, the concrete floor dynamited out and the area was being excavated for a boiler room. The whole area had been reclaimed, reinforced, solidified and built over so long ago, that no one visiting it for the first time, as I did, would have guessed that it was not original solid ground.

The stub of piling from which I dug most grubs had been covered by a depth of fill, of four feet by actual measurement, not counting concrete. The piles in the area were from four to six feet apart and in no instance did the top of one of them protrude above the ashes and all of them contained grubs and were thoroughly riddled, and all had been covered with ashes and with concrete.

How did the grubs get into those piles and how long had they been there?

In the January 1937 number of Volume **69**, The Canadian Entomologist, R. E. Balch of Fredericton, New Brunswick, published a detailed summary of literature concerning *N. melanura*, and a careful account of his finding it in the wharf of the Atlantic Sugar Refinery at Saint John, N.B. He mentions that the beetle was recorded from Nanaimo, B.C., in 1928 and from Vancouver, no date, so it not new to this coast. His larvae when full grown were 30 mm. long whereas those I obtained were from 13 mm. to 26 mm. long and were therefore apparently not full grown. He says that the beetle is about 10 mm. long and flies during July and August; it is attracted to situations at tide level and its grubs live in damp wood.

It appears that one of two theories might account for this remarkable and extensive infestation at the British Columbia Sugar Refinery: ONE, that it started in piles soon after they were driven and that the beetles are capable of developing, mating and reproducing in tunnels, year after year, without having to come to the surface; or TWO, that the larvae either undergo a lengthy diapause or, in damp wood that is shut off from the surface, are extremely slow in developing. This second theory has some support in Balch's article wherein he quotes Laing (1936) writing in the "Entomologist's Monthly" who records an instance of living larvae being

found in wood which had been entirely surrounded by concrete, for seven years. Now Balch found that full grown larvae are 30 mm. long and I found one, obviously only partly grown, that was only 13 mm. long. If damp conditions in an enclosed space induce protracted development of these larvae, how long could they remain under these conditions, without becoming beetles? Surely this constitutes a record in any beetle larvae, of delayed development, and provides material for long term experiments in physiology and metamorphosis to determine the factors that enable larvae to survive under these conditions.

THE 1945 STATUS OF DIGONOCHAETA SETIPENNIS, TACHINID PARASITE OF THE EUROPEAN EARWIG FORFICULA AURICULARIA LINN. IN WEST POINT GREY, VANCOUVER, B.C.

G. J. SPENCER
Department of Zoology, University of British Columbia, Vancouver, B.C.

For at least fifteen years I have collected earwigs every autumn around West Point Grey for student instruction and have maintained them alive in cages, taking them out as required. Up to 1943, there was no indication in this caged material of parasitism by *Digonochaeta setipennis* Fall., the tachinid fly that was introduced from Europe about fifteen years ago, to control this pest. However, in 1943, when making the usual autumn collection by placing sacking and rolled-up newspapers in the crotches of trees in the garden, one fly puparium was obtained, so in 1944 the catch was closely watched and four puparia were obtained. In early October, 1945, the usual catch of two nights' collecting was placed in a pint jar with leaves, dried grass and crumpled paper for the earwigs to hide in and in the process of collecting, sixteen fly puparia were obtained from the sacking and were placed with the earwigs in the jar.

In the next few weeks some 30 earwigs were used for class purposes and the rest, numbering 58, were stored in the jar in an unheated laboratory.

During the winter the earwigs died off at intervals, but a few were still alive by the end of January. Shortly afterwards all were dead and when the mass was counted on 16th February, 57 puparia were obtained; deducting the 16 obtained at time of collecting, 41 maggots had emerged during the winter from 58 earwigs, giving a parasitism of 70.7 per cent.

Unfortunately, the earwig collections of 1943 and 1944 were not counted, so the percentages are not available for those years. However, the sudden leap in infestation in 1945 was most conspicuous since, apart from those stored for observation, *setipennis* puparia occurred freely all over the garden wherever earwigs were sheltering, in bits of dahlia and lupin stalks, between boards and under trash where none had occurred in previous years.

The history of parasite release in Vancouver since 1936 was sent to me by W. Downes who was in charge of this work and I am greatly indebted to him for the following figures:

In May 1936, five thousand and nineteen *setipennis* puparia were placed out in five sub-equal lots in north and south Kitsilano. In July of the same year, 16,000 parasitized earwigs were released in thirteen locations all the way from Stanley Park, the West End and Kitsilano, to Central Park; of these, 1,000 were released at 8th Avenue and Tolmie, 1,000 at 10th Avenue near Sasamat Street and 1,000 at the University. These last three points are distant 666 yards, 900 yards and two miles, respectively, from where my collections were made. In August, 10,000 were released at ten locations throughout Vancouver, of which 1,000 were released near the

University, the nearest point to my collecting ground.

In August 1937, two thousand parasitized earwigs were released in two spots remote from my area and in July 1938, four thousand were released in four locations also far removed from my area.

In all, 37,019 prospective *D. setipennis* were released over a period of three years in the Greater Vancouver area.

Concerning the recovery of these parasites, seven years after 2,000 infested earwigs had been released in 1936 in my neighborhood, one puparium showed up in my garden; eight years afterwards, four puparia were found under similar collecting conditions, and nine years afterwards they had increased enormously, by October 1945 occurring freely everywhere and running up to 70.7 per cent in a given number of earwigs counted.

A second series, of 71 earwigs, collected in October 1945 in a garden at 20th Avenue and Dunbar, was maintained under similar conditions all winter and was finally counted at the same time as the above series. The collection point is 3,000 yards as the crow flies from my garden and the only *setipennis* liberations made at all near it in the past were the 1,000 parasitized earwigs released respectively at 10th and Sasamat and at 8th and Tolmie in July 1936. This second series yielded eleven puparia, giving 15.5 per cent parasitism.

DISCUSSION:—Taking as a centre, a spot halfway between the 1936 liberation points at 10th and Sasamat and at 8th and Tolmie, in just over nine years the tachinid fly *Digonochaeta setipennis* had spread south and uphill about 1.26 miles and yielded 15.5 per cent parasitism of the European earwig; north and downhill and about 0.45 miles away, it yielded 70.7 per cent parasitism. Subtracting these percentages from 100 and considering the distances proportionately, from the liberation centre, the 15.5 per cent obtained 1.26 miles away is only 3.4 per cent decrease per mile less than that obtained 0.45 miles away.

Thus radiating out from a common centre of liberation, the fly parasitized earwigs south and uphill, only 3.4 per cent mile less than it did north and downhill, in a fairly uniformly built-over area of the city of Vancouver.

THE STATUS OF ANOBIUM PUNCTATUM, THE DEATH WATCH BEETLE, IN THE LOWER FRASER VALLEY IN 1946. (Coleoptera: Anobiidae)

G. J. SPENCER
Department of Zoology, University of British Columbia, Vancouver, B.C.

In 1925 a round stick, apparently of alder wood, was brought to me from a farm on Lulu Island with the report that it was a piece of an old handle found lying around the barn. The wood was thoroughly perforated by borings and yielded a copious amount of fine dust. Three dead specimens of *Anobium punctatum* Degeer, the European death watch beetle, were obtained from the wood, but since I was new to the Province I did not appreciate the significance of the incident.

In a paper on Insects and other Arthropods in buildings in British Columbia (Proc. Ent. Soc. Brit. Col., **39**: 23-29) I mentioned a record in New Westminster of an insect infesting a piano which had been brought around the Horn 50 years before. Specimens of the beetle were not obtained but the account sent in of the borings and the dust extruded, suggested an infestation of *A. punctatum*. Treatment with orthodichlorbenzene was recommended and was apparently successful because no further complaints were received.

Another record mentioned in that article concerned the 3-ply hardwood back of a china cabinet which had been so riddled by borers that it collapsed and the owner had torn it off and replaced it. The cabinet had been purchased at an auction and had possibly been imported from Europe.

From that time up to 1944 no further infestations were encountered. In January and February 1945, however, three records were reported to me, two of them in one day; in two of these I obtained beetles or enough parts of beetles, to identify the insects definitely as *A. punctatum*. One record concerns massive antique carved oak chairs in a farm-house near Langley Prairie, from which the owner tapped out and sent to me a two-ounce bottle of boring dust which yielded the remains of approximately twelve beetles, all *A. punctatum*. The infestation seemed so active that I recommended fumigation with methyl bromide, which was apparently successful. The chairs were family heirlooms sent out from Germany some time ago, although the infestation became serious relatively recently.

The second of these 1945 reports concerns all of the 3-ply wooden walls of a basement room in a Vancouver home, which began to show small round holes and a little boring dust. There were relatively few holes but the owner became alarmed and began to tear out the 1/3-inch-thick plywood, only to find it a mere shell with the middle layer particularly, tunnelled in all directions and crumbling away. He sent in speciments of the damaged wood and one beetle which proved to be *A. punctatum*, but could offer no suggestion whatever as to the origin of the infestation.

The final record includes the entire basement woodwork of a house in North Vancouver where the owners noticed an increasing number of holes appearing in the 2- by 4-inch studding and shiplap and, on tapping with a hammer, found the timber a mere shell with the inside reduced practically to dust. Bit by bit, they located the worst areas of infestation and replaced them, heavily creosoting new wood and what remained of the old. Samples of wood sent in with copious boring dust and frass, showed that this same beetle was concerned.

In none of these records have the owners been bothered by adult beetles swarming around the house; only a few seem to come out of the timber and then only at odd times so that they never become conspicuous.

In the last two records involving the structural timbers, the owners declared that no antique furniture had been stored in the basements so it would appear that the infestations were of local origin and that this beetle has become established in the Lower Fraser Valley where the mild climate would seem to favour its development.

A. punctatum or the death watch beetle is an insidious insect whose damage inside timber is far greater than the small number of exit holes would indicate, and the public will have to be warned to be on the lookout for it.

ON THE OVIPOSITION HABITS OF DARGIDA PROCINCTA (Lepidoptera: Phalaenidae).—At dusk on the evening of July 10, I was watering my lawn in Vancouver with a fine mist spray, when several moths flew into the orbit of the spray and started ovipositing in the short lawn grass. Each moth hovered a little and then settled for five or six seconds with the tip of her abdomen protruded and inserted into the bases of the grass leaves and then moved to another spot a few inches away to repeat the manoeuvre, always within the limits of the falling water. By slowly shifting the hose back and forth, I was able to govern the movements of the moths which persistently followed the zone of the spray. After proving that the falling water was apparently a necessity for the act of oviposition, I pounced on one of the moths and the others flew away.

In the insect collections of the Museum of Zoology at this University, I found three specimens of this moth taken, respectively, at Princeton, July 23, and at Victoria, August 6 and September 15, and these, with my record of July 10, show a wide range in this Province, both in time and in territory.

The moth is **Dargida procincta** (Grote), the olive green cutworm of which Essig[1] says—"(it) has a wing expanse of 45 mm., is dark brown with olive tints, and with cream cross and longitudinal lines on the fore wings. The mature caterpillars are 30–35 mm. in length, dark olive green with a pale dorsal line and three greenish lateral lines separated by brownish grey. They are often serious pests to wild and tame grasses in meadows and pasturelands in Oregon, Washington and British Columbia, but are also known in California and Colorado."

Judging by my record, the moths of the olive green cutworm oviposit at dusk during rain: egg-laying seems dependent on the falling of the rain.—G. J. Spencer, Department of Zoology, University of British Columbia, Vancouver, B.C.

[1] Essig, E. O., 1926. Insects of Western North America, p. 684. MacMillans.

A LIST OF THE LEPIDOPTERA COLLECTED IN THE SHUSWAP LAKE DISTRICT OF BRITISH COLUMBIA BY DR. W. R. BUCKELL

E. R. BUCKELL[1]
Dominion Entomological Laboratory, Kamloops, B.C.

Nearly all the species listed below were collected by Dr. W. R. Buckell on his own small farm and orchard at South Canoe, four miles southeast of Salmon Arm, B.C. A few specimens were taken as far east as Revelstoke and as far west as Chase.

The collection also contains a few species from typical Dry-belt areas, such as the Okanagan Valley and the Nicola-Kamloops District, but these are not included in the present list as it is the author's intention to list only those found in the Shuswap Lake District, a definite biotic area typical of the humid transition zone. This area is mountainous, and fairly uniformly covered with forests which are typical of the Interior Douglas fir type and thus occupies a climatic zone that is intermediate in temperature conditions between the yellow pine of the Dry-belt and the Engelmann spruce type of the higher elevations.

All the specimens are beautifully spread even to the smallest of the micros, and many were reared from their larvae.

The list contains 773 species, varieties and forms consisting of 541 macrolepidoptera and 232 microlepidoptera[2].

The list is arranged according to the "Check List of the Lepidoptera of Canada and the United States of America," Part I, 1938, and Part II, 1939, by J. McDunnough, and the dates after the species name give the earliest and latest dates of capture.

1 ACKNOWLEDGMENTS: Determinations of material had previously been made for Dr. W. R. Buckell by Dr. J. McDunnough of the Division of Systematic Entomology, Ottawa, and by the late Mr. E. H. Blackmore of Victoria, B.C. Recently Dr. J. McDunnough and Mr. T. N. Freeman of the Division of Entomology greatly assisted me in further determinations and in correcting and bringing this list up to date, for which I wish to extend my grateful thanks.

2 As some of the groups of microlepidoptera are under revision, definite determinations were not always possible and some species will be found to be marked "?"; others recorded as "near" to a species; while others are recorded as "undetermined species."

MACROLEPIDOPTERA

Suborder RHOPALOCERA (Butterflies)

Superfamily PAPILIONOIDEA

Family PAPILIONIDAE

Papilio L.
8 zelicaon *Luc.* .....June 2-12
16 rutulus *Luc.* .....May 9, July 7
18 eurymedon *Luc.* .....May 10-30

Parnassius Latr.
27 smintheus magnus *Wgt.*..June 6, July 7

Family PIERIDAE

Anthocharis Bdv.
34 sara flora *Wgt.* .....April 4, May 25

Euchloe Hbn.
36 ausonides *Bdv.* .....May 3-23

Colias Fabr.
47 alexandra emilia *Edw.* ...May 5, Oct. 3

Neophasia Behr.
76 menapia *F. & F.* .....Aug. 8-27

Pieris Schrank
80 sisymbrii flavitincta *Comst.* ...May 23
81 occidentalis calyce *Edw.* July 5, Aug. 25
83 napi *gen. vern.* marginalis *Scud.* .....April 28, May 5
86 rapae *L.* .....April 21, Aug. 17

Family DANAIDAE

Danaus Kluk
89 plexippus *L.* .....June 6, Aug. 8

Family SATYRIDAE

Coenonympha Hbn.
109 inornata columbiana *McD.* .....May 5, June 29

Minois Hbn.
117 alope *Fabr.* .....July 14-29
e boopis *Behr* .....June 6, Aug. 4

Oeneis Hbn.
126 nevadensis *F. & F.* ....May 23, June 20

Erebia Dalm.
150 epipsodea *Butl.* .....May 2-31

Family NYMPHALIDAE

Subfamily NYMPHALINAE

Argynnis Fabr.
165 leto *Behr.* .....Aug. 8
171 atlantis beani *B. & B.* .....July 1
178 hydaspe sakuntala *Skin.*July 6, Aug. 14
184 bremnerii picta *McD.* ..Aug. 7, Sept. 21
191 nevadensis semivirida *McD.* ....July 18
199 eurynome opis *Edw.* .....Aug. 14

Brenthis Hbn.
200 myrina *Cram.* .....May 31
212 bellona *Fabr.* .....May 24
213 epithore obscuripennis *Gund.*...July 31

Euphydryas Scud.
222 anicia hopfingeri *Gund.*..May 2, June 18

Melitaea Fabr.
246 paula *Edw.* .....May 2, July 7
Phyciodes Hbn.
265 tharos pascoensis *Wgt.*...May 30, Aug. 9
267 campestris *Behr.* .....May 21, Sept. 29
Polygonia Hbn.
287 satyrus *Edw.* .....March 23, Aug. 17
288 faunus rusticus *Edw.*..March 20, Aug. 21
291 zephyrus *Edw.* .....April 18, Aug. 21
Nymphalis Kluk
295 j-album watsoni *Hall* ..July 17, Aug. 21
296 californica *Bdv.* .....June 12, Aug. 12
297 milberti furcillata *Say*.May 14, Sept. 30
298 antiopa *L.* .....April 4, Aug. 19
Vanessa Fabr.
299 atalanta *L.* .....July 1, Aug. 22
301 cardui *L.* .....June 9, Sept. 12
Basilarchia Scud.
324 lorquini burrisonii *Mayn.* ....June 6-27

Family LYCAENIDAE
Subfamily THECLINAE

Strymon Hbn.
380 titus *Fabr.* .....July 7-18
382 californica *Edw.* .....July 4, Aug. 14
392 saepium okanagana
McD. .....July 19, Aug. 26
Incisalia Scud.
404 iroides *Bdv.* .....April 11, May 21
409 polios *Cook & Wats.* ..April 18, May 16
412 eryphon *Edv.* .....April 10 May 5

Subfamily LYCAENINAE

Lycaena Fabr.
430 mariposa *Reak.* .....Aug. 14
432 helioides *Bdv.* .....May 15, Sept. 18

Subfamily PLEBEIINAE

Everes Hbn.
448 amyntula *Bdv.* .....May 21, June 10
Plebeius Kluk
449 scudderii *Edw.*
(Atypical) .....July 12, Aug. 14
450 melissa *Edw.* .....May 5, Aug. 5
451 anna *Edw.* .....Aug. 8
(Probably subspecies of scudderii *Edw.*)
453 saepiolus *Bdv.* .....May 5, July 3
455 icarioides montis
Blkmre. .....May 22, June 23
Phaedrotes Scud.
472 piasus daunia *Edw.* .....May 23
Glaucopsyche Scud.
473 lygdamus columbia
Skin. .....April 24, June 2
Lycaenopsis F. & F.
475 pseudargiolus
Bdv. & Lec. .....April 8, May 5
c nigrescens *Fletch.* .....April 19-26

Superfamily HESPERIOIDEA
Family HESPERIIDAE
Subfamily PYRGINAE

Thorybes Scud.
505 pylades *Scud.* .....May 30, June 17
Pyrgus Hbn.
516 ruralis *Bdv.* .....April 26, May 7
521 communis albescens *Ploetz* ....May 23

Erynnis Schr.
541 icelus *Scud. & Burg.*...April 28, June 4
546 persius fredericki
Freeman .....April 26, May 12
549 callidus *Grin.* .....May 24

Subfamily HESPERIINAE

Ochlodes Scud.
604 sylvanoides *Bdv.* .....June 6, Sept. 5
Amblyscirtes Scud.
660 vialis *Edw.* .....May 30, June 13

Suborder HETEROCERA (Moths)
Superfamily SPHINGOIDEA
Family SPHINGIDAE
Subfamily ACHERONTIINAE

Sphinx L.
721 mordecai *McD.* .....May 19, Aug. 21
730 drupiferarum utahensis
Hy. Edw. .....July 2-7
Smerinthus Latr.
739 jamaicensis *f. norm.* geminatus
Say .....June 2, July 12
740 cerisyi ophthalmicus
Bdv. .....June 2, Aug. 18
Paonias Hbn.
741 excaecata *A. & S.* .....July 7
Pachysphinx R. & J.
745 modesta *Harr.* .....July 2-7
Hemaris Dalm.
770 diffinis rubens *Hy. Edw.* May 17, July 3

Subfamily PHILAMPELINAE

Proserpinus Hbn.
789 clarkiae *Bdv.* .....May 9, June 2
790 flavofasciata ulalume *Stkr.* ...May 5-10

Subfamily CHOEROCAMPINAE

Celerio Cken.
798 gallii intermedia *Kby.*..June 28, July 3
799 lineata *Fabr.* .....June 24 Sept. 4

Superfamily SATURNIOIDEA
Family SATURNIIDAE

Platysamia Grt.
807 euryalus kasloensis
Ckll. .....May 1, June 6
Telea Hbn.
812 polyphemus *Cram.* ....May 18, June 13
Pseudohazis G. & R.
840 eglanterina *Bdv.* .....July 4-16

Superfamily NOCTUOIDEA
Family NOLIDAE

Celama Wlk.
891 minna *Butl.* .....April 7, May 6

Family ARCTIIDAE
Subfamily LITHOSIINAE

Lexis Wallgr.
905 bicolor *Grt.* .....Aug. 1-18
Crambidia Pack.
911 casta *Pack.* .....Aug. 10-27
Clemensia Pack.
952 albata *Pack.* .....June 30, July 30
Hyperprepia Hbn.
958 miniata *Kby.* .....July 19, Aug. 5

Subfamily ARCTIINAE

Halisidota Hbn.
980 maculata angulifera *Wlk.* ....May 5-28

Cycnia Hbn.
991 tenera *Hbn.* .....June 10-20

Eubaphe Hbn.
1023 ferruginosa *Wlk.* .....June 29
a immaculata *Reak.* ....June 1, July 27

Apantesis Wlk.
1034 intermedia *form* stretchii *Grt.*....Aug. 6
1035 parthenice *Kby.* .....July 29, Aug. 13
1047 nevadensis superba *Stretch* ..Aug. 8-30

Leptarctia Stretch
1063 californiae *Wlk.* .....April 26, May 30

Diacrisia Hbn.
1065 virginica *Fabr.* .....May 14, June 2
1066 vagans kasloa *Dyar* ...May 24, June 10

Isia Wlk.
1069 isabella *A. & S.* .....June 26

Estigmene Hbn.
1070 acrea *Dru.* .....May 4, June 18
1073 congrua *Wlk.* .....May 16, June 21

Hyphantria Harr.
1075 cunea *Dru.* .....May 28

Parasemia Hbn.
1092 parthenos *Harr.* .....June 4-25

Platyprepia Dyar
1096 guttata *Bdv.* .....June 24
form ochracea *Stretch*..June 14, July 2

Family AGARISTIDAE

Alypia Hbn.
1116 langtoni *Couper* .....June 23
1117 ridingsi *Grt.* .....May 21-June 11

Family PHALAENIDAE
Subfamily PANTHEINAE

Raphia Hbn.
1141 frater *Grt.* .....June 23

Subfamily ACRONICTINAE

Acronicta Ochs.
1152 hesperida *Sm.* .....June 13-25
1155 innotata *Gn.* .....May 20, June 13
1160 grisea revellata *Sm.* .....June 3-18
1168 funeralis *G. & R.* .....May 25, June 6
1175 furcifera *Gn.* .....June 23
1185 fragilis minella *Dyar* ..May 16, July 22
1201 impleta illita *Sm.* .....June 6-15
1206 distans dolorosa *Dyar* .....May 10
1211 perdita *Grt.*

Subfamily PHALAENINAE
(Agrotinae)

Euxoa Hbn.
1243 andera *Sm.* .....Aug. 27, Sept. 3
1250 ridingsiana *Grt.* .....Aug. 9-12
1252 flavicollis *Sm.* .....July 7
1274 intrita *Morr.* .....Aug. 1-20
form strigilis *Grt.* .....Aug. 16
form reuda *Stkr.* .....Aug. 9-21
1278 infracta *Morr.* .....Aug. 5-19
1280 infausta *Wlk.* .....July 23, Aug. 5
1284 sponsa *Sm.* .....July 24, Aug. 20
1289 perfusca *Grt.* .....Aug. 2-25
a cocklei *Sm.* .....July 28, Aug. 25
1292 perpolita *Morr.* .....Aug. 9-16
1294 stigmatalis *Sm.* .....July 19, Aug. 2
1309 mimallonis gagates
Grt. .....Aug. 19, Sept. 9
1310 messoria *Harr.* .....Aug. 1-22
form atrifera *Grt.* .....Aug. 10-28
1318 atropulverea *Sm.* .....Sept. 9
1322 ontario *Sm.* .....Aug. 7-19
1324 quinquelinea *Sm.* .....Aug. 22, Oct. 9
b incallida *Sm.* .....Sept. 3
1341 tessellata *Harr.* .....July 8-27
a atropurpurea *Grt.* .....July 11
c flaviscapula *Sm.* .....July 28, Aug. 4
d tesselloides *Grt.* .....July 18, Aug. 12
1343 esta *Sm.* .....Aug. 27
1351 declarata *Wlk* .....Aug. 6, Sept. 3
1352 campestris *Grt.* .....July 25, Aug. 27
1353 verticalis *Grt.* .....June 23, Aug. 17
1354 albipennis *Grt.* .....Aug. 24, Sept. 3
1355 lillooet *McD.* .....July 27, Aug. 22
1366 divergens *Wlk.* .....June 22, July 23
1370 obeliscoides *Gn.* .....Aug. 16-24
1371 redimicula *Morr.* .....July 21, Aug. 16
1372 costata *Grt.* .....June 25, July 25
a idahoensis *Grt.* .....June 27, Aug. 3
1378 ochrogaster *Gn.* .....July 26, Aug. 30
1379 excellens *Grt.* .....Aug. 15, Sept. 15
1383 brocha *Morr.* .....Aug. 10, Sept. 9

Chorizagrotis Sm.
1389 thanatologia *Dyar* .....Sept. 9
form perfida *Dod.* ....June 17, Aug. 18

Pseudorthosia Grt.
1403 variabilis *Grt.* .....Aug. 12-28

Agrotis Ochs.
1416 vetusta catenuloides *Sm.*
July 25, Aug. 28
1426 vancouverensis semiclarata *Grt.*
June 14-21
1432 volubilis *Harv.* .....May 12, June 7

Feltia Wlk.
1442 ducens *Wlk.* .....Aug. 10-30
1446 herilis *Grt.* .....July 18-28

Actebia Steph.
1452 fennica *Tausch* .....June 23, Aug. 28

Spaelotis Bdv.
1472 clandestina *Harr.* ....June 22, July 3
1473 havilae *Grt.* .....July 9

Eurois Hbn.
1475 occulta *Linn.* .....June 7-20
1476 astricta subjugata *Dyar*
July 23, Aug. 16
1477 nigra *Sm.* .....Aug. 13, Sept. 19

Metalepsis Grt.
1494 salicarum *Wlk.* .....Apr. 4

Peridroma Hbn.
1496 margaritosa *Haw.* ....Sept. 1, Nov. 1
form saucia *Hbn.* .....Sept. 9, Dec. 15

Pseudospaelotis McD.
1499 haruspica inopinatus *Sm.*
June 16, Aug. 1

Diarsia Hbn.
1504 cynica perumbrosa *Dyar* .....Aug. 12
1510 rosaria *Grt.* .....May 21, Aug. 18

Graphiphora Ochs.
1511 c-nigrum Linn. .. ....June 6, Aug. 15
1512 smithi *Snell* .....June 22, Aug. 27
1517 oblata *Morr.* .....June 11, Aug. 2
1522 collaris *G. & R.* .....June 20, Aug. 25

Anomogyna Staud.
1561 elimata *Gn.* .....Aug. 17
1564 vernilis *Grt.* .....July 22, Aug. 28

Adelphagrotis Sm.
1567 indeterminata *Wlk.* ..July 28, Aug. 15

Apiectoides Butl.
1568 condita *Gn.* .....June 6

Anaplectoides McD.
1569 pressus fales *Sm.* .....June 6, Aug. 24
1570 prasina *Schiff.* .....July 30, Aug. 20

Protolampra McD.
1571 rufipectus *Morr.* .....July 4, Aug. 8

Pseudoglaea Grt.
1574 olivata *Harr.* .....Aug. 26, Sept. 15

Eueretagrotis Sm.
1577 perattenta *Grt.* .....July 11
a inattenta *Sm.* .....July 14

Abagrotis Sm.
1587 apposita *Grt.* .....Aug. 8-11
1590 sambo *Sm.* .....July 24, Aug. 11
1593 placida *Grt.* .....Aug. 1, Sept. 10
1598 variata *Grt.* .....Aug. 12
1599 scopeops *Dyar* .....June 26, Aug. 19

Rhynchagrotis Sm.
1606 insularis *Grt.* .....May 10, July 16
form confusa *Sm.* ....June 17, Aug. 25

Ufeus Grt.
1610 electra *Sm.* .....Oct. 13-28
1612 hulsti *Sm.* .....Feb. 1, Nov. 7

Subfamily HADENINAE.

Scotogramma Sm.
1633 trifolii *Rott.* .....July 21, Aug. 23
1639 oregonica *Grt.* .....May 17, June 18

Mamestra Ochs.
1660 configurata *Wlk.* .....June 3, July 8

Polia Ochs.
1662 discalis *Grt.* .....June 12, Aug. 20
1663 nimbosa *Gn* .....June 6, July 28
1669 purpurissata *Grt.* .....July 2-31
b crydina *Dyar* .....July 3
1672 grandis *Bdv.* .....May 19-25
1673 subjuncta *G. & R.* .....June 12-19
1678 nevadae *Grt.* .....June 24, July 21
1679 radix *Wlk.* .....June 29, July 16
1680 segregata *form* negussa *Sm.*
April 20, May 19
1684 tacoma *Stkr.* .....May 18, July 16
1689 meodana *Sm.* .....June 9-20
1691 adjuncta *Bdv.* .....June 7, July 9
1694 pulverulenta *Sm.* ....May 19, June 22
1697 cristifera *Wlk.* .....May 19, June 18
1699 lutra *Gn.* .....June 12, July 1
1706 montana *Sm.* .....June 4
1709 detracta *Wlk.* .....June 10-28
a neoterica *Sm.* .....June 12-23

Lacinipolia McD.
1714 lustralis *Grt.* .....June 18-25
1716 anguina larissa *Sm.* ..June 12, July 23
1735 vicina *Grt.* .....July 13, Aug. 28
1736 pensilis *Grt.* .....July 24, Aug. 16
1739 stricta cinnabarina *Grt.* ....Aug. 8-21
1744 lorea *Gn.* .....June 10-26
1746 comis *Grt.* .....June 18, July 29
a obnigra *Sm.* .....June 5 Aug. 25
b rectilinea *Sm.* .....July 30

Sideridis Hbn.
1800 rosea *Harv.* .....March 18, June 3
1802 maryx *Gn.* .....June 8

Protorthodes McD.
1841 curtica *Sm.* .....Aug. 14-20
1855 oviduca *Gn.* .....May 11, June 2

Anhimella McD.
1886 contrahens infidelis *Dyar* ..June 17-21

Nomorthodes McD.
1885 hanhami *B. & McD.* .....June 11
1890 furfurata uniformis *Sm.*
June 13, July 19
1891 communis *Dyar* .....July 23, Aug. 6
1892 fractura mecrona *Sm.* ..June 2, July 1

Nephelodes Gn.
1895 emmedonia pectinata *Sm.*
June 19, Aug. 20

Xylomyges Gn.
1906 hiemalis *Grt.* .....April 19
1909 crucialis *Harv.* .....April 3, May 16
1913 candida *Sm.* .....April 23-28
1914 dolosa *Grt.* .....April 4, May 14
1915 rubrica *Harv.* .....May 1-26
1916 perlubens *Grt.* .....April 17, May 12

Stretchia Hy. Edw.
1920 plusiaeformis *Hy. Edw.* .....May 25

Acerra Grt.
1923 normalis *Grt.* .....April 2

Orthosia Ochs.
1925 pulchella achsha *Dyar* .....April 22
1940 revicta *Morr.* .....April 30, May 14
1942 pacifica *Harv.* .....April 11
1943 hibisci quinquefasciata *Sm.*
March 18, May 25

Dargida Wlk.
1952 procincta *Grt.* .....June 22, Sept. 23

Zosteropoda Grt.
1955 hirtipes *Grt.* .....June 13

Leucania Ochs.
1977 commoides *Gn.* .....June 10-26
1984 farcta roseola *Sm.* ....June 18, July 20
1992 insueta heterodoxa *Sm.* ....June 14-25
1995 luteopallens *Sm.* ....June 18, July 31

Subfamily CUCULLIINAE

Pleroma Sm.
2026 obliquata *Sm.* .....April 2-4
2027 tonuscula *Sm.* .....April 10, May 1
2029 cinerea *Sm.* .....Sept. 18, Oct. 9

Cucullia Schrank
2041 florea obscurior *Sm.* .....Aug. 10
2042 postera *Gn.* .....July 1
2043 omissa *Dod.* .....June 7, Aug. 4

Cryptocnemis Led.
2073 pudorata *Sm.* .....Aug. 10
2111 columbia *McD.* .....Aug. 12
2116 piffardi *Wlk.* .....Aug. 17, Oct. 6
2132 major *Grt.* .....July 11
2133 chandleri *Grt.* .....Aug. 12, Sept. 3

Feralia Grt.
2186 comstocki columbiana *Sm.*
April 28, May 16

Bombycia Steph.
2205 rectifascia *Sm.* .....July 25-Aug. 2

Hillia Grt.
2212 maida *Dyar* .....Aug. 29, Sept. 18

Litholomia Grt.
2215 napaea *Mor.* .....March 3, Nov. 22

Lithomoia Hbn.
2216 solidaginis *Hbn.* .....Aug. 20-28

Graptolitha Hbn.
2221 innominata *Sm.* ....March 18, Sept. 3
2222 petulca *Grt.* .....Sept. 14, Oct. 8
2223 ferrealis *Grt.* .....Sept. 8-28
2235 vivida *Dyar* .....Aug. 18, Oct. 28
2241 tepida *Grt.* .....Sept. 17, Oct. 19
2244 georgii *Grt.* .....April 19, Sept. 27
b holocinerea *Sm.* .....Oct. 23

2248 fagina *Morr.* .....March 12, Oct. 27
2253 dilatocula *Sm.* .....April 26, Oct. 12

Xylena Ochs.
2260 curvimacula *Morr.* .March 17, Sept. 30
2262 thoracica *Put.-Cram.* ..Sept. 26, Oct. 11
2263 cineritia *Grt.* .....Sept. 19 Oct. 11

Xylotype Hamp.
2266 acadia *B. & B.* .....Aug. 28, Sept. 1

Platypolia Grt.
2268 anceps *form* aplectoides *Gn.* Sept. 16-20
2270 loda *Stkr.* .....Sept. 8, Oct. 2

Mniotype Franel.
2273 versuta *Sm.* .....Aug. 1, Sept. 19
2276 miniota *Sm.* .....May 8, July 30

Fishia Grt.
2278 evelina hanhami *Sm.* ..Sept. 8, Oct. 13
2281 yosemitae *Grt.* .....Oct. 12-24

Anytus Grt.
2288 profunda *Sm.* .....Aug. 28, Sept. 17

Eupsilia Hbn.
2303 tristigmata *Grt.* .....March 3, Oct. 17
2307 fringata *B. & McD.* ..Sept. 15, Oct. 13

Parastichtis Hbn.
2309 discivaria *Wlk.* .....July 29, Aug. 15

Lycanades Franc.
2310 purpurea *Grt.* .....Aug. 25-30
a antapica *Sm.* .....Sept. 18-26

Rusina Steph.
2313 verberata *Sm.* .....July 29, Aug. 28
2315 decipiens *Grt.* .....Sept. 1-8

Xanthia Ochs.
2316 lutea *Strom.* .....Aug. 22, Sept. 1

Eucirrhoedia Grt.
2321 pampina *Gn.* .....Aug. 5, Sept. 2

Homoglaea Morr.
2322 carbonaria *Harv.* ..March 31, April 18
2323 dives *Sm.* .....March 19, Nov. 1

Subfamily AMPHIPYRINAE

Septis Hbn.
2336 antennata purpurissata *B. & McD.* June 16, July 1
2342 auranticolor *Grt.* .....June 2
b sora *Sm.* .....July 16-26
2344 vultuosa *Grt.* .....Aug. 8-21
2351 arctica *Frr.* .....June 18, July 28
2352 castanea *Grt.* .....July 14, Aug. 10
2362 impulsa *Gn.* .....July 23
2365 finitima cerivana *Sm.* May 11, June 16

Agroperina Hamp.
2366 lateritia *Hufn.* .....June 26, Aug. 1
2368 dubitans cogitata *Sm.* ..July 2, Aug. 5

Crymodes Gn.
2375 devastator *Brace* ....July 29, Aug. 22
2378 longula *Grt.* .....July 24-28

Aseptis McD.
2400 binotata *Wlk.* .....July 20-30

Oligia Hbn.
2413 indirecta *Grt.* .....June 27, July 31
2423 illocata *Wlk.* .....Aug. 25, Sept. 2
2424 mactata allecto *Sm.* .....Sept. 3-8
2557 divesta *Grt.* .....Aug. 16-21

Eremobina McD.
2430 claudens *Wlk.* .....Aug. 15, Sept. 8

Ipimorpha Hbn.
2453 pleonectusa *Grt.* .....July 16, Aug. 12

Helotropha Led.
2457 reniformis *Grt.* .....Aug. 18, Sept. 6

Euplexia Steph.
2533 benesimilis *McD.* .....June 15-21

Phlogophora Tr.
2536 periculosa *form* v-brunneum *Grt.* July 31, Aug. 26

Achytonix McD.
2558 epipaschia *Grt.* .....Aug. 16-17

Amphipyra Ochs.
2584 pyramidoides *Gn.* .....Aug. 13-17
2585 tragopoginis *L.* .....July 20-22

Andropolia Grt.
2602 aedon *Grt.* .....July 21, Aug. 7
2603 theodori epichysis *Grt.* July 30, Aug. 16

Hyppa Dup.
2607 xylinoides *Gn.* .....June 17, July 17

Elaphria Hbn.
2647 festivoides *Gn.* .....May 16, June 23

Platyperigea Sm.
2656 extima *Wlk.* .....July 27, Aug. 12
2657 meralis *Morr.* .....July 25, Aug. 8

Enargia Hbn.
2685 decolor *Wlk.* .....Aug. 5, Sept. 6

Pyrrhia Hbn.
2715 umbra exprimens *Wlk.* L May 27, June 12

Eutricopis Morr.
2871 nexilis *Morr.* .....June 23

Subfamily HELIOTHIINAE

Melicleptria Hbn.
2913 sueta *Grt.* .....May 22, July 31
2915 honesta *Grt.* .....May 23

Dysocnemis Grt.
2920 oregonica *Hy. Edw.* .....June 26

Subfamily ACONTIINAE

Erastria Ochs.
3119 albidula *Gn.* .....May 31, July 5

Subfamily NYCTEOLIDAE

Nycteola Hbn.
3235 frigidana *Wlk.* .....Aug. 9-15
3235a cinereana *N. & D.*.....April 22, July 4

Subfamily PLUSIINAE

Syngrapha Hbn.
3254 rectangula nargenta *Ottol.* ..Aug. 7-14
3255 celsa *Hy. Ed.* .....Aug. 8
3256 angulidens excelsana *Strand* ..Aug. 14
3257 alias interalia *Ottol.* .....June 10
3264 epigaea *Grt.* .....Aug. 24, Sept. 6
3265 ampla *Wlk.* .....July 7-19
3266 selecta *Wlk.* .....July 13, Aug. 26

Anagrapha McD.
3252 falcifera *form* simplex *Gn.* ....Aug. 22

Autographa Hbn.
3285 bimaculata *Steph.* .....Aug. 6
3286 mappa *G. & R.* .....Sept. 18
3278 californica *Speyer* ...April 23, Aug. 21
3292 metallica *Grt.* .....June 22, Sept. 29

Plusia Ochs.
3295 aereoides *Grt.* .....July 7

Subfamily CATOCALINAE

Catocala Schrank
3344 relicta *Wlk.* .....Aug. 22, Sept. 8
3355 californica *Edw.* .....July 28, Aug. 13
3357 briseis *Edw.* .....July 25, Oct. 11

3360 nevadensis *form* montana *Beut.*
Aug 2-31

Euclidina McD.
3426 cuspidea *Hbn.* .....May 15-25

Caenurgina McD.
3427 annexa *Hy. Edw.* .....May 16
3430 crassiuscula *Haw.* .....May 7, Aug. 5

Zale Hbn.
34 84 minerea norda *Sm.*....April 17, May 23
3489 benesignata *Harv.* ....May 19, June 6

Toxocampa Gn.
3538 victoria *Grt.* .....July 28, Aug. 8

Melipotis Hbn.
3551 jucunda *Hbn.* .....May 25, June 2

Synedoida Hy. Edw.
3578 adumbrata *Behr.* .....May 21, July 6

Scoliopteryx Germ.
3615 libatrix *L.* .....July 31, Aug. 21

Subfamily HYPENINAE

Bomolocha Hbn.
3690 palparia *Wlk.* .....June 17
3698 toreuta *Grt.* .....June 21

Hypena Schrank
3706 humuli *Harr.* .....April 4, Aug. 19

Subfamily RIVULINAE

Mycterophora Hlst.
3711 longipalpata *Hlst.* .....July 31, Aug. 7

Rivula Gn.
3732 propinqualis *Gn.* .....July 6

Subfamily HERMINIINAE

Epizeuxis Hbn.
3735 aemula *Hbn.* .....July 8-21

Chytolita Grt.
3767 petrealis *Grt.* .....May 28, June 28

Philometra Grt.
3770 metonalis *Wlk.* .....June 23, July 25

Bleptina Gn.
3797 caradrinalis *Gn.* ....June 24, Sept. 16

Palthis Hbn.
3807 angulalis *Hbn.* .....May 16, June 12

Family NOTODONTIDAE

Ichthyura Hbn.
3822 apicalis *Wlk.* .....May 15, June 18
3827 albosigma specifica *Dyar*
May 11, Aug. 1

Datana Wlk.
3829 ministra *Dru* .....May 21

Hyperaeschra Butl.
3844 pacifica *Behr* .....May 5

Odontosia Hbn.
3847 elegans *Stkr.* .....July 6

Nadata Wlk.
3857 gibbosa oregonensis *Butl.* ..June 9-29

Schizura Dbldy.
3920 ipomoeae *Dbldy.* .....Aug. 6
3921 concinna *A. & S.* .....May 15, Aug. 9
3924 unicornis *A. & S.* .....June 24

Cerura Schrank
3938 scolopendrina *Bdv.* .....June 11

Gluphisia Bdv.
3940a severa *form* normalis *Dyar* ...May 9

Family LIPARIDAE

Notolophus Germ.
3943 antiqua badia *Hy. Edw.* Aug. 22, Oct. 17

Hemerocampa Dyar
3945 pseudotsugata *McD.* .....Aug. 19

Olene Hbn.
3954 vagans *B. & McD.* .....July 1, Aug. 8

Superfamily BOMBYCOIDEA
Family LASIOCAMPIDAE

Tolype Hbn.
3978 velleda *Stoll* .....July 6

Malacosoma Hbn.
3989 americana *Fabr.* .....July 3-14
3997 disstria *Hbn.* .....June 27, July 17

Epicnaptera Ramb.
3999 americana *Harr.* .....April 20, May 2

Superfamily DREPANOIDEA
Family THYATIRIDAE

Habrosyne Hbn.
4004 scripta *Gosse.* .....June 10, July 7

Pseudothyatira Grt.
4007 cymatophoroides *Gn.* ..June 12, July 9
form expultrix *Grt.* ..June 20, July 21

Euthyatira Sm.
4010 pudens *Gn.* .....April 20, May 19

Cerura emota Clarke
4014 tearlei *Hy. Edw.* .....Sept. 5-12

Family DREPANIDAE

Drepana Schrank
4020 arcuata siculifer *Pack.* April 28, June 6
4021 bilineata *Pack.* .....May 5, Sept. 1

Superfamily GEOMETROIDEA
Family GEOMETRIDAE
Subfamily BREPHINAE

Brephos Zinck.
4023 infans oregonensis *Swett*
March 24, April 19

Subfamily GEOMETRINAE
(Hemitheinae)

Nemoria Hbn.
4059 darwiniata *Dyar* ....June 29, July 24

Synchlora Gn.
4074 rubrifrontaria *Pack.* .....July 7

Mesothea Warr.
4090 viridipennata *Hlst* ..April 11, May 10

Subfamily STERRHINAE
(Acidaliinae)

Scelophia Hlst.
4127 hepaticaria *Gn.* .....April 21, May 15

Scopula Schrank
4144 quinquelinearia *Pack.* .....June 8-21
4147 ancellata *Hlst.* .....July 7 Aug. 3
4157 subfuscata *Tayl.* ....May 16, June 13

Sterrha Hbn.
4180 demissaria columbia *McD.* ....June 31
4195 rotundopennata *Pack.* .....June 3-25

Cosymbia Hbn.
4211 pendulinaria *Gn.* ....June 26, July 24
a griseor *McD.* .....June 29

Subfamily LARENTIINAE

Nyctobia Hlst.
4223 limitaria nigroangulata *Stkr.*
Aril 17, May 14

Cladara Hlst.
4225 atroliturata *Wlk.* .....April 13, June 1

Lobophora Curt.
4228 sinuata *Swett* .....May 24, June 13

Neodezia Warr.
4235 albovittata tenuifasciata *B. & McD.* June 4

Cporophtera Hbn.
4239 bruceata *Hlst.* .....Oct. 21, Nov. 14

Oporinia Hbn.
4243 autumnata henshawi *Swett* Sept. 5, Oct. 25

Triphosa Steph.
4244 haesitata *Gn.* .....Sept. 13, Nov. 4
form pustularia *Hy Edw.* March 23, Dec. 3

Calocalpe Hbn.
4247 undulata *Linn.* .....June 1, July 19

Coryphista Hlst.
4248 meadi *Pack.* .....April 26, July 31
form badiaria *Hy. Edw.* May 9, July 27

Eupithecia Curt.
4267 misturata *Hlst.* .....April 10, June 29
4276 castigata *Hbn.* .....June 10-16
4287 palpata *Pack.* .....May 5
4288 columbiata *Dyar* .....May 5, June 5
4290 maestosa dyarata *Tayl.* June 30, Aug. 8
4321 terminata *Tayl.* .....June 11
4330 coagulata Gn. .....May 12, Aug. 3
4331 geminata *Pack.* .....June 26-31
4336 innotata kootenaiata *Dyar* .....June 7
4341 georgii *McD.* .....May 24, June 16
4342 sobrinata niphadophilata *Dyar* Aug. 28
4346 annulata *Hlst.* ....March 18, April 17
4347 usurpata *Pears.* .....March 28
4350 cretaceata *Pack.* ..... Aug. 14
4358 agnesata *Tayl.* .....June 7
4363 tenuata *Hist.* .....June 22
4383 ravocostaliata *Pack.* .....May 7-11

Horisme Hbn.
4393 intestinata *Gn.* .....June 11

Eustroma Hbn.
4398 nubilata *Pack.* .....May 17, Sept. 7

Lygris Hbn.
4407 xylina *Hlst.* .....June 20, Aug. 11

Plemyria Hbn.
4412 georgii *Hlst.* .....Aug. 10, Oct. 15

Dysstroma Hbn.
4416 citrata *Linn.* .....June 8, Sept. 15
b mulleolata *Hlst.* .....June 5-27

Ceratodalia Pack.
4429 gueneata *Pack.* .....July 16, Aug. 20

Hydriomena Hbn.
4465 furcata *Thun.* .....June 25, Aug. 9
4477 pluviata *Gn.* .....June 17, Aug. 16
4485 renunciata *form* pernigrata *B. & McD.* June 1-3

Xanthorhoe Hbn.
4515 defensaria *Gn.* .....April 16, Oct. 13
4516 ferrugata *Clerk.* ....April 26, May 28
4519 incursata lagganata *S. & C.* ....Aug. 4
4524 pontiaria *Tayl.* .....May 14, June 31

Entephria Hbn.
4541 multivagata *Hlst.* ....July 4 Sept. 25

Mesoleuca Hbn.
4546 ruficillata *Gn.* .....May 16-18
4547 gratulata latialbata *B. & McD.* April 19, May 2

Epirrhoe Hbn.
4548 tristata *Linn.* .....May 23
4549 plebeculata *Gn.* .....May 25
4551 alternata *Mull.* .....May 22, July 25

Spargania Gn.
4555 magnoliata pernotata *Hlst.* June 8, Aug. 7

Euphyia Hbn.
4558 unangulata intermediata *Gn.* June 26
4561 multiferata *Wlk.* .....May 20

Eulype Hbn.
4573 hastata *Linn.* .....May 21, July 2

Perizoma Hbn.
4581 curvilinea *Hlst.* .....May 19, June 13

Earophila Gumpb.
4587 vasiliata *Gn.* .....April 9 May 25

Venusia Curt.
4593 pearsalli *Dyar* .....April 17, May 20

Hydrelia Hbn.
4597 albifera *Wlk.* .....July 1

Subfamily ENNOMINAE

Bapta Steph.
4605 semiclarata *Wlk.* ....April 28, May 16

Deilinia Hbn.
4612 variolaria *Gn.* .....June 13, Sept. 5
4614 erythemaria *Gn.* .....May 23

Drepanulatrix Gump.
4617 rectifascia *Hlst.* .....May 16, Aug. 8
4618 bifilata *Hlst.* .....March 20, July 3
4622 falcataria *Pack.* ....April 27, May 13
4628 pulveraria *Hlst.* .....May 2-15
4630 litaria *Hlst.* .....April 4, Sept. 21
4634 unicalcararia *Gn.* ....June 20, Aug. 12

Sericosema Warr.
4645 juturnaria *Gn.* .....June 20, July 16

Isturgia Hbn.
4658 truncataria *Wlk.* .....May 11-30

Philobia Dup.
4664 ulsterata *Pears* .....May 23, July 12

Semiothisa Hbn.
4675 adonis *B. & McD.* .....July 1
4680 granitata *Gn.* .....May 31, Aug. 26
4683 denticulata *Grt.* .....May 25 July 5
4725 neptaria sinuata *Pack.* ..May 6, Aug. 5

Itame Hbn.
4757 quadrilinearia *Pack.* ..June 28, Aug. 28
4762 exauspicata *Wlk.* .....July 4-31
4768 plumosata *B. & McD.* ..July 9, Aug. 12
4771 bitactata *Wlk.* .....Aug. 13
4772 denticulodes *Hlst.* .....July 16
4782 matilda *Dyar* .....May 25, June 26
4784 hulstiaria *Tayl.* .....June 3, Aug. 31

Elpiste Gump.
4799 lorquinaria *Gn.* .....July 16, Aug .28

Hesperumia Pack.
4801 sulphuraria *Pack.* ....June 19, July 30
form baltearia *Hlst.* .....June 28

Dasyfidonia Pack.
4806 avuncularia *Gn.* .....May 23

Paraphia Gn.
4809 subatomaria *Wood* ....June 12, July 4

Melanolophia Hlst.
4859 imitata *Wlk.* .....May 2, June 15

Protoboarmia McD.
4875 porcelaria indicataria *Wlk.* May 10, July 29

Stenoporpia McD.
4900 excelsaria *Stkr.* .....May 31
4905 satisfacta *B. & McD.* ..July 24, Aug. 26

Vitrinella McD.
4908 pampinaria *Gn.* .....May 16, June 10

Anacamptodes McD.
4913 emasculata *Dyar* ....May 17, June 21

Aethalura McD.
4945 anticaria fumata *B. & McD.*
April 11, June 7

Ectropis Hbn.
4946 crepuscularia *Schiff.* April 10 May 24

Coniodes Hlst.
4955 plumogeraria *Hlst.* .....March 23

Erannis Hbn.
4963 vancouverensis *Hlst.* .....Oct. 3-16

Lycia Hbn.
4966 ursaria *Wlk.* .....April 6, May 26

Amphidasis Tr.
4968 cognataria *Gn.* .....June 11, July 11

Euchlaena Hbn.
4997 johnsonaria *Fitch* ....July 25, Aug. 11
4998 mollisaria *Hlst.* .....July 23-31
5001 astylusaria *Wlk.* .....June 11
5005 tigrinaria *Gn.* .....June 7-28

Spodolepis Hlst.
5012 substriataria danbyi *Hlst.*
April 9, May 19

Campaea Lam.
5015 perlata *Gn.* .....June 21, July 17

Anthelia Hlst.
5019 taylorata Hlst. .....May 15

Philedia Hlst.
5027 punctomacularia *Hlst.* Aug. 11, Sept. 18

Plagodis Hbn.
5034 approximaria *Dyar* .....July 27

Anagoga Hbn.
5042 pulveraria *Linn.* .....May 8-29

Hyperetis Gn.
5043 amicaria *H.-S.* .....May 16, June 26

Nematocampa Gn.
5044 limbata *Haw.* .....July 22, Aug. 24

Metarranthis Warr.
5050 duaria *Gn.* .....May 16, June 7

Metanema Gn.
5054 inatomaria *Gn.* .....June 20

Pero H. -S.
5073 giganteus *Grossb.* .....Aug. 6-8
5080 morrisonarius *Hy. Edw.* May 19 June 8

Phengommataea Hlst.
5083 edwardsata *Hlst.* .....Aug. 8-10

Enypia Hlst.
5091 perangulata *Hlst.* .....Aug. 10-11
5095 packardata *Tayl.* .....Aug. 11

Nepytia Hlst.
5111 semiclusaria pellucidaria *Pack.*
Sept. 11, Oct. 9

Caripeta Wlk.
5125 divisata *Wlk.* .....July 4-17

Besma Capps
5145 quercivoraria *Gn.* ....May 27, July 25

Lambdina Capps
5146 fiscellaria lugubrosa *Hlst.*
Aug. 24, Sept. 15

Neoterpes Hlst.
5158 trianguliferata *Pack.* May 14, June 27

Sicya Gn.
5161 macularia *Harr.* .....June 21, July 21

Deuteronomos Prout
5170 magnarius *Gn.* .....Sept. 11-21

Synaxis Hlst.
5189 jubararia *Hlst.* .....Sept. 17, Oct. 20
5191 cervinaria *Pack.* .....June 7

Tetracis Gn.
5198 lorata *Grt.* .....May 16-23

Prochoerodes Grt.
5210 forficaria combinata *McD.*
June 10, July 3

Superfamily URANIOIDEA
Family EPIPLEMIDAE

Callizzia Pack.
5223 amorata *Pack.* .....June 10

MICROLEPIDOPTERA

Superfamily ZYGAENOIDEA
Family LIMACODIDAE

Tortricidia Pack.
5279 testacea crypta *Dyar* ..May 13, June 28

Superfamily PYRALIDOIDEA
Family PYRALIDAE
Subfamily GLAPHYRIINAE

Egesta Rag.
5338 eripalis *Grt.* .....July 7-21

Subfamily PYRAUSTINAE

Sameodes Snell.
5427 elealis *Wlk.* .....April 20

Evergestis Hbn.
5436 subterminalis *B. & McD.* .....Aug. 8
5438 simulatalis *Grt.* .....Aug. 9-20

Nomophila Hbn.
5455 noctuella *D. & S.* .....May 5

Loxostege Hbn.
5462 chortalis *Grt.* .....May 10, June 14
5478 sticticalis *Linn* .....May 31, Aug. 26

Perispasta Zell.
5545 caeculalis *Zell.* .....June 10-24

Phlyctaenia Hbn.
5553 itysalis *Wlk.* .....Aug. 12, Sept. 18
5564 tertialis *Gn.* .....June 6, July 10

Pyrausta Schrank
5598 fumalis *Gn.* .....July 23, Aug. 21
5602 fumoferalis *Hlst.* .....May 21, June 3
5607 unifascialis *Pack.* .....June 18-26
5609 fodinalis *Led.* .....June 2, July 7
5621 borealis *Pack.* .....May 23, June 13
5622 subsequalis *Gn.* .....May 5, June 27
5625 ochosalis *Dyar* .....June 5
5633 signatalis *Wlk.* .....June 17-24
5647 funebris *Strom.* .....May 31, June 19

Subfamily SCOPARIINAE

Scoparia Haw.
5728 tricoloralis *Dyar* .....July 21
5730 rectilinea *Zell* .....July 29, Aug. 10
5747 basalis *Wlk.* .....June 26, July 29

Subfamily PYRALINAE

Pyralis Linn.
5758 farinalis *Linn.* .....June 6, July 31

Subfamily CRAMBINAE

Crambus Fabr.
5857 pascuellus *Linn.* .....June 14, July 5
5861 leachellus *Zinck* .....Aug. 10-28
5863 praefectellus *Zinck.* .....May 7, June 5
5864 carpenterellus ? *Pack.* .....Aug. 21
5878 myellus *Hbn.* .....July 22, Aug. 16
5883 hortuellus *Hbn.* .....Aug. 18-23
5887 innotatellus *Wlk.* ....June 27, Aug. 10
5892 vulgivagellus *Clem.* .....Aug. 9-24
5893 plumbifimbriellus *Dyar* June 28, Aug. 2
5911 murellus *Dyar* .....May 23, June 20
5915 nevadellus *Kft.* .....May 11, Sept. 21
5919 trisectus *Wlk.* .....July 8, Aug. 14

Thaumatopsis Morr.
5942 repandus ? *Grt.* .....Aug. 22
—— 1 *undetermined sp.* .....Sept. 8

Subfamily EPIPASCHIINAE

Tetralopha Zell.
6042 aplastella *Hlst.* .....July 7, Aug. 16
—— 1 *undetermined sp.* ....July 7, Aug. 16

Subfamily PHYCITINAE

—— 1 *undetermined sp.* .....June 11-18

Myelois Hbn.
6063 obnupsella *Hlst.* .....May 24

Acrobasis Zell.
—— 1 *undetermined sp.* .....July 28

Dioryctria Zell.
6129 *near* abietella *D. & S.* .....July 30
6130 ponderosae ? *Dyar* .....Aug. 9
6131 rendiculella *Grt.* .....Aug. 10

Ambesa Grt.
6156 laetella *Grt.* .....June 17, July 21

Nephopteryx Hbn.
6163 ovalis *Pack.* .....June 28, July 21
6167 fasciolalis *Hlst.* .....Aug. 3

Meroptera Grt.
6185 nebulella *Riley* .....June 26

Laodamia Rag.
6227 fusca *Haw* .....May 24, July 25

Pyla Grt.
6235 scintillans *Grt.* .....June 17-26

Epischnia Hbn.
6254 albocostalialis *Hlst.* ..May 23, June 17

Zophodia Hbn.
6303 grossulariae *Riley* ...April 11, May 16

Euzophera Zell.
6318 ochifrontella *Zell.* .....July 24

Vitula Rag.
6324 serratilineella *Rag.* ..April 13, Sept. 30

Valdivia Rag.
—— 1 *undetermined sp.* .....May 23

Homoeosoma Curt.
6370 mucidellum ? *Rag.* .....June 23

Ephestiodes Rag.
6379 gilvescentella *Rag.* ....June 1, July 15
6380 *near* infimella *Rag.* .....July 15

Ephestia Gn.
6399 kuehniella *Zell.* .....Sept. 9
—— 1 *undetermined sp.* .....June 22

Family PTEROPHORIDAE

Pterophorus Geoff.
6471 delawaricus *Zell.* .....July 3-24

Platyptilia Hbn.
6473 fuscicornis *Zell.* .....Aug. 13
6474 tesseradactyla *Linn.* .....June 1-20
6476 pallidactyla *Haw.* .....June 1-18
6477 carduidactyla *Riley* .. May 18, Sept. 22
6482 albertae *B. & L.* .....July 31, Aug. 14
6484 punctidactyla *Haw.* .March 30, July 24
6490 edwardsii *Fish* .....June 2, Aug. 14
6491 albiciliata *Wlshm.* .....Aug. 14
6495 orthocarpi *Wlshm.* ....June 15, Aug. 4
6496 fragilis *Wlshm.* .....Aug. 14
6498 *near* maea *B. & L.* .....May 22

Oidaematophorus Wallen.
6523 occidentalis *Wlshm.* ....July 10, Aug. 2
6561 homodactylus *Wlk.* ..June 26, July 18
6563 stramineus *Wlshm.* .....July 5
6578 corvus *B. & L.* .....May 5-26
6588 monodactylus *Linn.* .....Oct. 20

Family ALUCITIDAE

Alucita Linn.
6591 huebneri *Wallen.* .....March 3

Superfamily TORTRICOIDEA
Family OLETHREUTIDAE
Subfamily OLETHREUTINAE

Badebecia Heinr.
6654 urticana *Hbn.* .....June 3, July 20

Exartema Clem.
6678 quadrifidum *Zell.* .....June 6
—— 1 *undetermined sp.* .....June 29

Olethreutes Hbn.
6716 albiciliana *Fern.* .....June 18
6719 galaxana *Kft.* .....June 18-23
6721 astrologana coronana *Kft.* .....May 5, June 18
6723 puncticostana major *Wlshm.* ..June 7
6728 cespitana *Hbn.* .....May 5, Aug. 6
6731 glaciana *Moesch.* ....June 18, July 12
6742 buckellana *McD.* .....June 11-23

Subfamily EUCOSMINAE

Thiodia Hbn.
6773 awemeana *Kft.* .....May 8
6778 formosana *Clem.* .....May 27
6810 rupestrana *McD.* .....May 12, June 20
6829 striatana *Clem.* .....May 22-29
6841 infimbriana *Dyar* .....July 31

Eucosma Hbn.
6870 ridingsana *Rob.* .....Aug. 1
6894 pergandeana *Fern.* ...May 23, June 12
6918 subflavana *Wlshm.* .....June 20
6972 dorsisignatana *Clem.* .Aug. 27, Sept. 11
6974 juncticiliana *Wlshm.* .....June 26
7004 cataclystiana *Wlk.* .....June 10-28

Epiblema Hbn.
7042 illotana *Wlshm.* ..... June 9-22
7043 culminana *Wlshm.* .....July 21
7047 abbreviatana *Wlshm.* ..May 15, June 20

Gypsonoma Meyr.
7058 fasciolana *Clem.* ....May 20, June 13

Pseudexentera Heinr.
7078 improbana oregonana *Wlshm.* March 7, April 28

Rhopobota Led.
7105 naevana *Hbn.* .....June 25, July 13

Epinotia Hbn.
7109 solandriana *Linn.* .....Aug. 6-10
7115 johnsonana *Kft.* .....May 17
7130 solicitana *Wlk.* .....May 22
7132 nisella *Clerck* .....June 20, Aug. 13
7135 transmissana *Wlk.* .....July 20-26
7148 emarginana *Wlshm.* .....June 20
7149 crenana *forms* .....Oct. 23, Feb. 14
7165 medioplagata *Wlshm.* .....June 20
7167 cruciana *Linn.* .....June 22
7170 seorsa *Heinr.* .....Sept. 14, Oct. 26

Anchylopera Steph.
7175 nubeculana *Clem.* .....June 20
7178 discigerana *Wlk.* .....May 13, July 16
7184 burgessiana *Zell.* .....Aug. 17

Ancylis Hbn.
7193 comptana *Froh.* .....May 19
7201 unguicella *Linn.* .....May 3-15
7203 mediofasciana *Clem.*..April 18, May 28

Hystricophora Wlshm.
7209 stygiana *Dyar* .....July 31, Aug. 5

Subfamily LASPEYRESIINAE

—— 1 *undetermined sp.* .....June 29

Dichrorampha Gn.
7219 kana *Busck* .....Aug. 1-4
7221 britana *Busck* .....May 29, June 17
7229 sedatana *Busck* .....May 24

Grapholitha Treit.
7245 prunivora *Walsh.* .....July 1, Aug. 11
7252 lunatana *Wlshm.* .....May 8

Laspeyresia Hbn.
7275 populana *Busck* .....July 7
72 4 prosperana *Kft.* .....May 23

Carpocapsa Treit
7301 pomonella *Linn.* .....July 15, Aug. 12

Family TORTRICIDAE

Sparganothis Hbn.
7333 irrorea *Rob.* .....June 19, July 20
7336 violaceana *Rob.* .....June 2

Platynota Clem.
7369 idaeusalis *Wlk.* .....June 22, July 11

Archips Hbn.
7378 persicana *Fitch* .....June 18, July 9
7384 cerasivorana *Fitch* ....June 22, July 7
7388 argyrospila *Wlk.* .....July 23-28
7405 rosaceana *Harris* .....June 17, July 3
7407 conflictana *Wlk.* .....July 3
7408 fumiferana *Clem.* ....July 12, Aug. 20

Tortrix Linn.
7410 pallorana *Rob.* .....July 1-20
7415 alleniana *Fern.* .....June 15, July 12
7417 lomonana *Kft.* .....Sept. 26
7420 peritana *Clem.* .....July 3, Aug. 3
7439 afflictana *Wlk.* .....May 5-30

Eulia Hbn.
7442 ministrana *Linn.* .....May 5, June 6

Cnephasia Curt.
7458 osseana *Scop.* .....Aug. 6, Sept. 2
7459 argentana *Cl.* .....June 11-13
7462 ednana *Kft.* .....July 8

Argyrotoxa Steph.
7469 albicomana *Clem.* .....July 12-30

Acleris Hub.
7473 fishiana *Fern.* .....Sept. 26
7476 maximana *B. & B.* ....Aug. 28, Oct. 28
7479 schalleriana *Linn.* .....Sept. 19
7481 variana *Fern.* .....Sept. 1
7485 celiana *Rob.* .....Oct. 15
7493 brittania *Kft.* .....Sept. 5
7494 fragariana *Kft.* .....Sept. 28
7495 inana *Rob.* .....May 1
7497 maculidorsana *Clem.* .....Aug. 12
7501 bowmanana *McD.* .....Oct. 19
7514 semiannula *Rob.* ....March 22, Oct. 30

Family PHALONIIDAE

Phalonia Hbn.
—— 2 *undetermined spp.* June 15, July 5
7530 deutschiana *Zett.* .....July 30
7539 angustana *Clem.* .....June 8
7555 *near* voxcana *Kft.* .....July 2
7584 albidana *Wlk.* .....June 6

Pharmacis Hbn.
7608 vitellinana *Zell.* ....May 27, June 17

Hysterosia Steph.
7615 cartwrightana *Kft.* .....June 14

Family CARPOSINIDAE

Bondia Newm.
7624 crescentella *Wlshm.* ..April 19, May 22

Family COSSIDAE

Prionoxystus Grt.
7670 robiniae *Peck* .....July 13

Superfamily GELECHIOIDEA
Family COSMOPTERYGIDAE

—— 2 *undetermined spp.* .....April 7-30

Cyphophora H.S.
7738 tricristatella *Cham.* .....Aug. 25

Walshia Clem.
7743 amorphella *Clem.* .....Aug. 13

Mompha Hbn.
7758 unifasciella ? *Cham.* .....May 15

Family GELECHIIDAE

—— 10 *undetermined spp.*

Recurvaria Haw.
—— 1 *undetermined sp.* ..April 26, July 12

Gelechia Hbn.
79_0 lugubrella *Fabr.* .....July 11
7998 *near* mandella *Busck* ..June 30, July 7
8020 mediofuscella *Clem.* .....May 19

Duvita Busck
8258 nigratomella *Clem.* .....June 11-13

Compsolechia Meyr.
8272 niveopulvella *Cham.* .....July 21

Family OECOPHORIDAE

Schiffermulleria Hbn.
8364 dimidiella *Wlshm.* ....May 14, June 30

Hofmannophila Spuler
8376 pseudospretella *Staint.* .....July 14

Depressaria Haw.
—— 1 *undetermined sp.* .....June 25

Agonopterix Hbn.
—— 1 *undetrmined sp.* .....May 5, Oct. 10
8431 rosaciliella *Busck* .....March 16-23
a echinopanicis ? *Clarke* ....Jan. 14-23
8435 klamathiana *Wlshm.* ..March 2, May 10

Semioscopis Hbn.
8460 inornata *Wlshm.* ....March 31, May 5
8461 megamicrella *Dyar* .....April 11-28

Family BLASTOBASIDAE

—— 4 *undetermined spp.*

Family ETHMIIDAE

Ethmia Hbn.
8612 monticola *Wlshm.* .....May 2-23

Eumeyrickia Busck
8390 trimaculella *Fitch* .....June 9-29

Superfamily YPONOMEUTOIDEA
Family GLYPHIPTERYGIDAE

Allonoyma Busck
8645 vicarialis *Zell.* .....Aug. 14

Choreutis Hbn.
8664 balsamorrhizella *Busck* .....June 5-18

Ellabella Busck
8680 editha *Busck* .....June 8

Family AEGERIIDAE

Bembecia Hbn.
8684 marginata *Harr.* .....Aug. 4-13

Albuna Hy. Edw.
8789 pyramidalis *Wlk.* .....June 13-21

Family PLUTELLIDAE

Trachoma Wall.
8842 falciferella *Wlshm.* March 13, April 20

Harpipteryx Hbn.
8845 dentiferella *form* canariella *Wlshm.* Aug. 29

Cerostoma Latr.
—— 1 *undetermined sp.* .....March 30
8847 rubrella *Dyar* .....March 15, April 14
8853 *near* radiatella *Don.* .....Jan. 14
—— radiatella *forms* ? March 13, April 19

Plutella Schr.
8875 interrupta *Wlshm.* .....May 4
8878 maculipennis *Curt.* .....Aug. 10

Family SCYTHRIDAE

Scythris Hbn.
8964 magnatella ? *Busck* .....Aug. 12

Superfamily TINEOIDEA
Family COLEOPHORIDAE

Coleophora Hbn.
9092 coruscipennella *Clem.* .....June 3

Family GRACILLARIIDAE

Parectopa Clem.
—— 1 *undetermined sp.* ? .....April 28

Gracillaria Haw.
—— pulchella *Cham. group.* .....May 3-16

Family TINEIDAE

Tinea Linn.
9644 *near* irrepta *Braun* .....June 27

Superfamily INCURVARIOIDEA
Family INCURVARIIDAE

Lampronia Steph.
9800 piperella *Busck* .....April 26, May 19
9803 sublustris *Braun* .....May 4-10

Chalceopla Braun
—— 1 *undtermined sp.* ....May 11, June 16

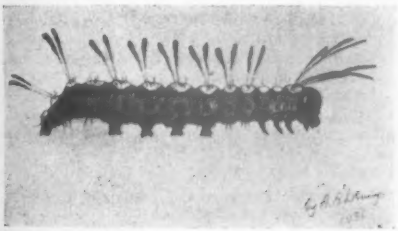
Suborder JUGATAE
Family ERIOCRANIIDAE

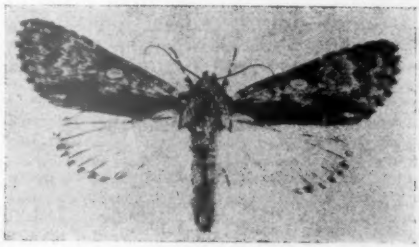
Mnemonica Meyr.
9853 aurosparsella *Wlshm.* .....July 25

Family HEPIALIDAE

Sthenopis Pack.
9859 purpurascens *Pack.* ....July 5, Aug. 6

Hepialus Fabr.
9868 mathewi *Hy. Edw.* .....Sept. 20





Acronicta funeralis G. and R. Mature larva from a specimen found on willow at Vernon, B.C., August, 1935, and drawn by the late Alex Dennys. Adult emerged May, 1936. From a photograph by A. A. Dennys.

REVISION OF CHECK LIST OF MACROLEPIDOPTERA OF B.C.—Any information intended to be included in this revision should be sent direct to J. R. J. LLEWELLYN JONES, "ARRANMORE," R.M.D. No. 1, COBBLE HILL, B.C., as soon as convenient. Records of localities (not previously reported), larval food plants and period of the year when imagines may be obtained, will be welcome. It is hoped to make the list as comprehensive and informative as possible. Any new records (if authentic), of species appearing in the Province will be especially welcome.

A LIST OF TWENTY SPECIES OF SPIDERS COLLECTED AT SALMON ARM, B.C.—The following species were collected at Salmon Arm, B.C., May-October 1940, by my mother, Olive R. Leech. I am indebted to Dr. W. J. Gertsch, who identified them in November, 1940, and brought the list up to date in 1946.

Pholcophora americana Banks.
Dictyna muraria Emerton.
Gnaphosa muscorum Koch.
Poecilochroa montana Emerton.
Drassodes neglectus Keyserling.
Anyphaena californica Banks.
Steatoda hespera Chamb. & Ivie.
Pityohyphantes sp.
Misumena calycina Linnaeus.
Philodromus alaskensis Keyserling.
Lycosa orophila Champ. & Gertsch.
Lycosa frondicola Emerton.
Phidippus johnsoni Peckham.
Metaphidippus aeneolus Curtis.
Paraphidippus marginatus Walckenaer.
Aranea dumetorum Villers.
Aranea solitaria Emerton.
Aranea gemmoides Chamb. & Ivie.
Aranea displicata Hentz.
Agelenopsis potteri Blackwall.

—Hugh B. Leech, Vernon, B.C.

POLLENIA RUDIS, THE CLUSTER FLY, IN VANCOUVER, B.C. (Diptera: Metopiidae).—Not until the spring of 1940, did I first find a specimen of **Pollenia rudis** (Fabr.) in Vancouver, although I had been on the lookout for it for many years. In that year one specimen was found shortly after 6 o'clock one bright morning, apparently ovipositing on or near earthworms on the lawn. Since then, several have been noted each year on the lawn between 6 and 7 o'clock in the morning, similarly engaged, on the dew-covered grass.

The species, however, has apparently been present in Vancouver for some time, since a complaint was received in 1943 from a householder on the extreme eastern boundary of the city, concerning large numbers of the flies which had come into the house and had wintered there unnoticed until spring when they crowded on the windows, seeking to escape outside. The citizen lived on a very large lot with a garden where much manure containing many earthworms, was present. The infestation was so extensive that it must have been several years in developing. In the spring of 1944 the citizen complained again of the trouble so I forwarded a 3% solution of DDT in "Varsol," a wartime cleaning fluid put out by the Imperial Oil Company, with instructions to spray it on all the woodwork of the window frames. The procedure was very successful for the woman telephoned two days later to report that a tremendous number of dead flies was on the floor below the windows, with no survivors.—G. J. Spencer, Department of Zoology, University of British Columbia, Vancouver, B.C.

REARING OF **AGROMYZA ALBITARSIS** AND ITS PARASITE **OPIUS** SP. (Diptera: Agromyzidae, and Hymenoptera: Braconidae).—On August 1, 1943, miners were noticed in the leaves of a seedling black cottonwood (**Populus trichocarpa** T. & G.) in my garden. The larvae could be seen clearly by holding a leaf up to the light. On August 11 a leaf containing two puparia was picked, and the parts containing the insects torn out and placed in a small jar on my desk. A fly emerged on August 28, and was subsequently identified by A. R. Brooks as **Agromyza albitarsis** Mg.

Mould was growing on the outside of the second puparium by September 2, so it was opened. It contained a slightly teneral but living wasp, a delicate little braconid. This specimen matured, and was identified by G. S. Walley as "**Opius** sp., probably undescribed. Runs to **amplus** Ashm. in Gahan's key." The fly and wasp are now in the Canadian National Collection.—Hugh B. Leech, Vernon, B.C.

GASOLINE FOR KILLING BEETLES.—The note by G. J. Spencer in the December, 1945, issue of our PROCEEDINGS (vol. 42, p. 16) on the use of gasoline in insect killing bottles is interesting. I recall that in World War I, during my term of service in the Imperial Camel Corps in Ezypt, I amassed a small collection of beetles. Cyanide was unobtainable so other means, fair or foul, had to be employed for killing and preserving specimens. Gasoline was plentiful in army trucks and cars and by employing stealth during the hours of darkness it was a fairly simple matter to secure enough for my purpose. After being killed in gasoline the beetles were placed in tin boxes with dry clean sand, which if packed fairly tightly prevented the specimens from rolling about in the box. Unfortunately, owing to a "misplaced" Turkish shell, a camel plus this collection was destroyed. I have used dry sawdust for the storage of beetles and it is satisfactory for any but small species.—E. P. Venables, Vernon, B.C.

A FEW RECORDS OF SPIDERS FROM BRITISH COLUMBIA AND ALBERTA.—I am indebted to Dr. W. J. Gertsch of the American Museum of Natural History for identifying the following species of spiders, which were sent to him from time to time.

Amaurobius severus Simon. Steelhead, B.C., summer of 1933, in log cabin (Hugh B. Leech); common.
Antrodiaetus sp., probably **pacificus** Simon. Oliver, B.C., May 1, 1940 (A. A. Dennys).
Hyptiotes gertschi Chamb. & Ivie. An egg sac spun on a conifer needle; Brennan Creek, Adams Lake, B.C., 1942 (P. T. Muskett).
Bathyphantes pallida Banks. Vernon, B.C., March 24, 1940 (Frances O. Leech).
Tetragnatha munda Chamberlin and Gertsch. Hope, B.C., May 30, 1940. (Hugh B. Leech).
Tetragnatha laboriosa Hentz. Hope, B.C., May 30, 1940 (Hugh B. Leech).
Misumena calycina Linnaeus. Penticton, B.C., April 19, 1940 (A. A. Dennys).
Xysticus pulverulentus Gertsch. Jasper, Alta., June 14, 1940 (E. H. Brasnett).
Coriarachne utahensis Gertsch. Kelowna, B.C., April 1940.
Neoantistea agilis Keyserling. Manson River, B.C., August, 1940 (Ray Gaul).
Arctosa emertoni Gertsch. Under stones edge of alkali Buse Lake, east of Kamloops, B.C., September 11, 1945 (Hugh B. Leech).
Phidippus tyrrelli Peckham, Fernie, B.C., August, 1939 (E. A. Quail).
Paraphidippus marginatus Walckenaer. Hope, B.C. May 30,1940 (Hugh B. Leech); Seebe, Alta., June 17, 1940 (J. McLenahan).
Metaphidippus aeneolus Curt's. Kelowna, B.C., April, 1940.

—Hugh B. Leech, Vernon, B.C.

LIST OF SOME PHILONTHUS FROM BRITISH CLUMBIA
(Coleoptera: Staphylinidae) [1]

HUGH B. LEECH
Vernon, B.C.

In 1937 and 1938 I sent a number of specimens of *Philonthus* to the Rev. C. E. Tottenham of the Royal Entomological Society of London. He identified and returned most of the material, which included the following species (the order is alphabetical). Specimens were collected by me, unless otherwise stated; all localities are in British Columbia.

(1) *Philonthus aurulentus* Horn (?) Nicola, 10. IV. 35 (lakeshore, under log).

(2) *Philonthus cephalotes* Grav. Salmon Arm, 4. V. 30.

(3) *Philonthus concinnus* Grav. Fernie, 26. VIII. 34 (faeces of horse), Salmon Arm, May 1934 (D. H. and O. Leech, Coll.).

(4) *Philonthus cruentatus* Gmel. Salmon Arm, 9. VI. 29; 10. V. 30; 30. IV. 31; 24. IV. 32 (under faeces of cow). Vancouver, 20. IV. 31 (human faeces). Vernon, 1.XII. 35 (under stones).

5) *Philonthus debilis* Grav. Salmon Arm, April 1935 (D. H. Leech, Coll.). Vancouver, 5. IV. 33 (under stone).

(6) *Philonthus ferreipennis* Horn? Vernon, 1. XII. 34 (lakeshore, under log).

(7) *Philonthus flavibasis* Casey. Vancouver, 20. IV. 31.

(8) *Philonthus furvus* Nordm. Fernie, 28. VIII. 34 (faeces of cow). Salmon Arm, May 1929.

(9) *Philonthus fuscipennis* Mannh. (*P. politus* Horn). Agassiz, 7. III. 31. Langley Prairie, 1931 (K. Graham, Coll.). Salmon Arm, 27. VII. 34 (O. R. Leech, Coll.). Vancouver, 14. VII. 32., 28. VI. 33. Vernon, 20. VI. 38 (D. Waddell, Coll.). Victoria, 10. VI. 31 (E. E. Peden, Coll.).

(10) *Philonthus grandicollis* Horn. Enderby, 15. IX. 34. Salmon Arm, 3. V. 35. Vernon, 15. VIII. 37.

(11) *Philonthus instabilis* Horn. Haney, 22. III. 30. Nicola, 10. IV. 35 (lakeshore, under log). Loon Lake, between Salmon Arm and Enderby, 27. X. 34. Vernon, 20. X. 34 (edge of stream) 5. X. 35 (lakeshore, under log).

(12) *Philonthus lecontei* Horn. Shuswap, 1. X. 33 (shore of small alkali pond). Vernon, 30. X. 31 (lakeshore, under log); 1. XII. 35.

(13) *Philonthus lomatus* Er. (?). Vernon, 7. VIII. 29 (immature).

(14) *Philonthus occidentalis* Horn. Vernon, 30. X. 31 (under log); 13. X. 33 (under log, shore of alkali lake); 28. VII. 38 (Deep Lake, shore).

(15) *Philonthus politus* L. (*aeneus* Rossi, of Horn). Vancouver, 23-25. III. 31. Salmon Arm, 8. IV. 34 (faeces of cow).

(16) *Philonthus protervus* Casey (?) Salmon Arm, 31. III. 32 (lakeshore, in earthen cell under log).

(17) *Philonthus puberulus* Horn. Salmon Arm, 5-6. X. 33 (gravel banks of Shuswap River).

(18) *Philonthus rectangularis* Sharp. Fernie, 3. VIII. 34. Salmon Arm, 8. XI.33 (faeces of cow); 20. IV. 35 (under dead pheasant). Vancouver, 18. III., 20. IV., 10. X. 31.

(19) *Philonthus siegwaldi* Mannh. Steelhead, 19. VII. 33 (in rotting rhubarb). Vancouver, 11. VI. 31 (Stanley Park). Trinity Valley, near Lumby, 29. VI. 37 (in human faeces).

[1] Contribution No. 2371, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

(20) *Philonthus sordidus* Grav. Kamloops, 3. II. 35 (on vegetables in cellar of house). Salmon Arm, 30. VI. 31; 1. IV. 32 (flying); 11. V. 33; 8. XI. 33 (faeces of cow). Vancouver, 4. IV. 31; 31. V. 31 (on snow, elev. 4,700 ft., Seymour Mtn.); 6. IV. 32 (in rotting cabbage). Vernon, 6. VI. 37 (in rotting vegetables in cellar).

(21) *Philonthus umbratilis* Grav. Salmon Arm, 21. III. 34 (barnyard, under board).

(22) *Philonthus varians* Payk. Vancouver, 20. IV. 31 (in human faeces).

(23) *Philonthus varius* Grav. Seymour Creek, N. Vancouver, B.C., 12. V. 31.

FURTHER RECORDS OF HETEROCERA OF THE NELSON-ROBSON-TRAIL DISTRICT OF BRITISH COLUMBIA (Insecta: Lepidoptera) [1]

HAROLD R. FOXLEE [2]
Robson, B.C.

AMATIDAE

872 *Scepsis packardii cocklei* Dyar
Robson 12.VII.45

PHALAENIDAE

1221 *Merolonche ursina* Sm.
Brilliant ..... No date

1709 *Polia detracta neoterica* Sm.
Brilliant 22.V.44

1984 *Leucania farcta roseola* Sm.
Brilliant 7.VII.44

2641 *Neperigea albimacula* B. & Mc. D.
Brilliant 21.VII.44

2647 *Elaphria festivoides* Gn.
Robson 8.VI.45

3763 *Epizeuxis jacchusalis bryanti*
Barnes. Brilliant 6.VII.44

GEOMETRIDAE

4147 *Scopula ancellata* Hlst.
Robson 20.VII.45

4225 *Cladara atroliturata* Wlk.
Robson 19.V.42

4515 *Xanthorhoe defensaria conciliaria*
Swett. Robson 19.IX.45

4573 *Eulype hastata gothicata* Gn.
Robson 22.VII.45

LIMACODIDAE

5279 *Tortricidia testacea* Pack.
Brilliant 9.VI.44

5647 *Pyrausta funebris* Strom.
Robson 23.V.45

6178 *Tlascala* sp. near *umbripennis*
Hlst. Robson 29.V.45

[1] The original list was published in this journal. See Vol. 42, p. 9-14, 1945.

[2] I wish to extend my grateful thanks to Dr. McDunnough of the Division of Entomology Ottawa for determinations.

ADDITIONAL RECORDS OF TABANIDAE FROM ROBSON, B.C. (Diptera).—The following species were collected by me at Robson, B.C. I am indebted to Dr. L. L. Pechuman of Lockport, N.Y., for the identifications.

Tabanus aeratus O.S. 18.IX.43
Tabanus sequax Will. 24.VII.45
at elev. of 4,000 feet
Tabanus rhombicus O.S. ..... July
Tabanus melanorhinus Bigot ..... July
Tabanus sonomensis O.S. ..... July
Tabanus sp. near **haemaphorus**
Apatolestes sp. nov.?

—Harold R. Foxlee, Robson, B.C.

HABITAT OF AGABUS BJORKMANAE (Coleoptera: Dytiscidae).—On August 26, 1945, I was collecting aquatics in the Goat River, Creston, B.C., when I took my first **Agabus bjorkmanae** Hatch (det. H. B. Leech). I had just demolished a log jam under a steep bank, close to shore; the water rapidly cleared and I was attracted by a number of small springs boiling up the clean, fine sand. Suddenly a large **Agabus** (species then unknown to me) was tossed into view, then others, each frantically digging for cover into the sand. I removed a few stones, stirred the sand, and captured 40 specimens. Then I partly restored the jam for future visits which lasted until Nov. 4, with a take of over 100 specimens. In every instance they were submerged in the fine sand until disturbed.—G. Stace Smith, Creston, B.C.

ANOPLITIS INAEQUALIS ON EPILOBIUM (Coleoptera: Chrysomelidae).—The taking of **Anoplitis inaequalis** (Web.) at Creston is a new record for British Columbia. I picked up several in general sweeping on a large meadow, but eventually traced them to the true host: **Epilobium adenocaulon**; thereafter I took them in quantity (June 3-Aug. 7, 1945). The specimens are darker than eastern examples but are otherwise identical, and have been closely examined by C. A. Frost and H. B. Leech.—G. Stace Smith, Creston, B.C.

NATURAL CONTROL OF THE EUROPEAN PEA MOTH LASPEYRESIA NIGRICANA ON SUMAS PRAIRIE, B.C. (Lepidoptera Olethreutidae).

H. G. FULTON
Dominion Entomological Laboratory, Agassiz, B.C.

HISTORY OF AREA INVOLVED. The area now known as Sumas Prairie was a lake before the reclamation scheme, sponsored by the Provincial Department of Agriculture, was completed in the year 1924. This area, approximately ten miles long and four miles wide was at one time covered with water for the greater portion of the year.

When dyking, draining and land clearing operations were completed and agriculture took over, it was soon learned that clover and peas were among the crops which could be grown most successfully on the sandy clay soil of the old lake bed.

INTRODUCTION OF THE PEA MOTH. It became the common practice to use peas as a nurse crop, seeded down with clover, or quite often peas were grown two and three years in succession on the same field. Soon large areas were devoted to pea growing. This procedure proved very suitable for the multiplication of the pea moth, *Laspeyresia nigricana* Stephens, which was apparently present in a nearby pea growing district south of the International Boundary.

By 1933, when 3,000 acres or more were devoted to pea growing in the Sumas area, infestation by the pea moth had become very heavy and severe losses were suffered by the growers.

In 1934, officers of the Agassiz Laboratory began a study of the conditions. According to literature *Laspeyresia nigricana* was accidentally introduced into Canada from Europe sometime before 1893, and became established without any of its natural enemies. Since then it has spread to most of the pea growing areas on this continent. Under conditions similar to those found on Sumas Prairie the pest soon becomes epidemic. By experiments a rotation control was demonstrated to be effective and practical, but this was not adopted by the growers.

PARASITE INTRODUCTION. Since this pest had several natural enemies in England, a study of the situation there was suggested by the Dominion Parasite Laboratory at Belleville, Ontario. Ewen Cameron of the Imperial Parasite Service made a study of the situation in England during the years 1936-37 and reported that *Ascogaster quadridentatus* Wesm., an egg parasite, was found in as high as 48 per cent of the pea moth larvae and *Glypta haesitator* Grav. and a species of *Angitia*, larval parasites, were attacking as high as 24 per cent. Parasite material was collected in England and sent to Canada from 1936 to 1939, when the outbreak of war caused this work to stop.

Before any imported European material was available the Belleville Laboratory propagated and made three shipments of the parasites, *Ascogaster carpocapsae* Vier. and *Macrocentrus ancylivorus* Roh., which had been reared successfully on the oriental fruit moth, *Laspeyresia molesta* Busck., a close relative of the pea moth. Total liberation of all parasites is shown in Table I.

METHOD OF TRANSPORT. Until 1938 parasites were shipped in refrigerated cages by railway express requiring four days to make the trip from Belleville to Agassiz. Only one shipment was received in which undue mortality had occurred by this method. Time, however, became an important factor, especially with shipments of egg parasite *A. quadridentatus*, as some were received too late to be liberated during the maximum egg laying period of the pea moth, which occurs about the end of June. By using non-refrigerated cages and air express, parasites could be picked up in Vancouver twelve hours after leaving the east, and delivery from Vancouver to Agassiz required an additional twenty hours. This method was used for all shipments made in 1939 without undue mor-

1 Contribution No. 2438, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Ont.

TABLE I
Liberations of Parasites Made in the Chilliwack and Sumas Areas

Year	Liberations of the North American Species: *A. carpocapsae*	*M. ancylivorus*	Liberation Point
1936	1266	1229	Chilliwack and Sumas
1937	50	....	Sumas
Total	1316	1229	

Year	Liberations of Imported European Species: *Ascogaster quadridentatus*	*Glypta haesitator*	*Angitia sp.*	Liberation Point
1937	34	...	14	Sumas
1938	880	735	5	Sumas and Chilliwack
1939	2367	23	44	Chilliwack
1939	2010	662	..	Sumas
1939	....	124	..	Nicomen Island
Total	5291	1544	63	

tality occurring. In eight shipments mortality varied from 5 to 65 per cent with an average of only 12 per cent. The following table shows the mortality by species.

TABLE II
Mortality of Parasites During Shipment

Species	Range in %	Average %
A. quadridentatus	5-19	10
G. haesitator	19-45	25
Angitia sp.	36-65	57

One shipment of *G. haesitator* was picked up in Vancouver thus saving 20 hours from a total of 32 hours en route. Only 13 per cent of this shipment had died at the time of liberation as compared to the average of 25 per cent in the other shipments of the same species.

RECOVERIES OF PARASITES. Large numbers of pea moth cocoons were collected each year to be used in the cultivation control experiments and some were also sent to Belleville for the purpose of parasite recovery checks. In the cultural experiments cages of cheesecloth were used; constructed over plots of soil twelve feet by three feet, artificially stocked with pea moth cocoons to test the effect of various soil cultivation practices on moth emergence. A check was also kept of the parasites that emerged.

First signs of parasitism were observed in 1938 when one speciment of *Angitia* was taken on June 25 from the experimental cages at Agassiz, in which 10,000 pea moth cocoons were being used in connection with the cultivation control experiments. A second specimen of the same genus was captured in a field on Sumas Prairie in early July. These recoveries were rather surprising as only fourteen individuals of *Angitia* had been liberated the previous year.

In 1939, six specimens of *G. haesitator* and a few doubtful specimens of *Angitia* were obtained from 8,000 cocoons used in the experiments.

In 1940, one specimen of *A. quadridentatus* was obtained from 6,000 cocoons at Agassiz; and from 10,500 cocoons sent to Belleville, 1 *A. quadridentatus*, 4 *G. haesitator* and 92 *Phanerotoma* species emerged. *Phanerotoma* is apparently a native hymenopteron which occasionally attacks the pea moth. The record of *A. quadridentatus* and *G. haesitator* was most encouraging as these species are largely responsible for the control of the pea moth in England.

In 1941, 6,000 cocoons at Agassiz, yielded 1 *Glypta haesitator* and 4 *Phanerotoma*, and from 3,360 cocoons sent to Belleville, 1 *G. haesitator* and 5 *Phanerotoma* were obtained.

In 1942, 2,000 cocoons at Agassiz gave 1 *A. quadridentatus*, 2 *G. haesitator* and 3 *Phanerotoma*; and from 3,350 cocoons sent to Belleville, 7 *A. quadridentatus*, 3 *G. haesitator* and 25 *Phanerotoma* emerged.

In 1943 no further cage experiments were carried on at Agassiz, but 4 *A. quad-*

ridentatus and 6 *G. haesitator* emerged from 706 cocoons sent to Belleville.

In 1944, 3,000 cocoons were sent to Belleville and these showed approximately 7 per cent parasitism, an appreciable increase.

During the summer months of 1944, specimens of *Ascogaster* and *Glypta* were occasionally caught in the net when sweeping pea fields and roadside patches of vetch. In the fall 3,800 pea moth cocoons were sent to Belleville and it was reported that 6 per cent of these were parasitized by *A. quadridentatus* and 3 per cent by *G. haesitator*.

In the pea flowering season of 1945 the presence of *A. quadridentatus* was quite noticeable, many specimens being captured in net sweeping in several different pea fields. A large amount of pea moth material in the form of infested pods was therefore gathered in early August, from which approximately 20,000 pea moth cocoons were obtained and shipped to Belleville in the fall. Dissection of some of this material showed 77.5 per cent and 8.3 per cent parasitism by *A. quadridentatus* and *G. haesitator*, respectively. However, as the material was all obtained, from only one field, this high percentage of parasitism might not hold for the entire Sumas Prairie area. Nevertheless the outlook is very favourable. In 1946 it is probable that one of the most destructive insect pests of peas will have been checked by its natural enemies, which were originally imported from England during the years 1937, 1938 and 1939.

We note that no recoveries were made of parasites of the oriental fruit moth, liberated in 1936 and 1937. Apparently the pea moth was not suitable as a host. It is also interesting to note that *Phanerotoma* was not recovered until after 1942.

The foregoing data in tabular form, show the gradual increase in percentage of parasitism.

TABLE III
Percentage of Parasitism of the Pea Moth on Sumas Prairie

Year	No. of Cocoons	*Ascogaster quadridentatus*		*Glypta haesitator*		*Angitia species*		*Phanerotoma species*		Total Per cent
		No.	%	No.	%	No.	%	No.	%	
1937	10,000	0	0	0	0	1	.01	0	0	.01
1938	8,000	0	0	6	.07	?	?	0	0	.1
1939	6,000	1	.02	?	0	0	0	0	0	.6
	10,500	1	.01	4	.04	0	0	92	.88	
1940	6,000	0	0	1	.02	0	0	4	.07	.12
	3,360	0	0	1	.03	0	0	5	.14	
1941	2,000	1	.05	2	.1	0	0	3	.15	.76
	3,350	7	.2	3	.09	0	0	25	.74	
1942	706	4	.56	6	.85	0	0	0	0	1.4
1943	3,000	0	0	0	0	0	0	0	0	7.
1944	3,800	0	6.0	0	3.0	0	0	0	0	9.
1945	20,000	0	77.5	0	8.3	0	0	0	0	85.8

SUMMARY.—1. The pea moth was introduced into the lower Fraser valley of British Columbia prior to 1933; had become a serious pest by 1934. 2. Commencing in 1936 and continuing until 1939 parasites were imported from England and liberated in the affected area. 3. A steady increase in the percentage of parasitism was observed since 1937. 4. Percentage of parasitism reached 85.5 per cent in 1945; indicating that a control of this important economic pest would be effected by two of its natural enemies.

LITERATURE CITED

Fletcher, J., 1899. Injurious insects in 1898. 29th Ann. Rept. Ent. Soc. Ont. (1898); p. 75-87 (pea moth, p. 78-79).

Cameron, E., 1938. A study of the natural control of the pea moth, **Cydia nigricana** Step. Bull. Ent. Res. 29 (3) :277-313.

Glendenning, R., 1943. The pea moth and its control in British Columbia. Field Crop Ins. Investig. No. 222, Dom. Ent. Lab. Agassiz, B.C.

Wishart, G., 1944. Note on the establishment in Canada of imported parasites of the pea moth, **Laspeyresia nigricana** Steph. Can. Ent. 75 (12) :237-238. (December, 1943, number, published January 17, 1944.)

RESULTS OF A SEASON'S STUDY OF THE EUROPEAN EARWIG, FORFICULA AURICULARIA (Dermaptera: Forficulidae)

RICHARD GUPPY
Wellington, B.C.

INTRODUCTION—The following observations were mainly made from captive earwigs. These were confined in glass jars to allow for close study. Much use has been made, largely for purposes of comparison, of the article by Geoffrey Beall (1932. The life history and behaviour of the European earwig, *Forficula auricularia*, L. in British Columbia. Ent. Soc. Brit. Col., Proc. **29**: 28-43), and of the paper by S. E. Crumb, P. M. Eide and A. E. Bonn (1941. The European earwig U.S. Dept. Agri. Bul. No. 766).

LIFE HISTORY—A short resume of the life history of the European earwig in this district may help to clarify the following discussion.

From my observation it appears that two batches of eggs from each female is the rule rather than the exception. The first is deposited during January and February, and does not hatch until warmer weather occurs. This is usually during the latter half of April.

The parents of these early nymphs then oviposit again in early June, the eggs in this case hatching in about 20 days. Both the early and late broods reproduce at about the same time the following spring.

The nymphal stage comprising four instars lasts under normal conditions between two and three months.

BROODING BY FEMALES—No doubt the habit of earwigs which provokes the most interest and discussion is the remarkable attention paid by the females to their eggs and young. It is generally assumed that the purpose is to protect the eggs from predators. I am inclined to believe, though, that very little can be accomplished in this direction by so small and weak an insect. On the other hand, it is clear that the habit must in some way benefit the species as a whole.

Crumb (p. 39) expresses the opinion that the eggs of earwigs cannot develop if deprived of the attentions of the parent insect. Before reading Crumb's work I had myself arrived at the same conclusion. Mould invariably appears on ova which are kept alone more than 5 or 6 days. Even packing them in sterile cotton in a sterilized vial does not prevent this trouble. Apparently the mould spores are present on the eggs themselves.

In nearly all cases which I was able to observe, some moving around of the ova was done by brooding females, due probably to the conditions under which they were forced to nest. For example, an earwig which at first had placed her eggs on the surface of soil in a crowded jar, later piled them on top of a small potato supplied as food. This was doubtless a desperate attempt to make the best of a bad situation, but it indicates an instinct which may sometimes enable earwigs to preserve their offspring. They might, for instance, move the eggs deeper into the soil if conditions become too dry, or to a higher spot in case of flooding. When the eggs are exposed to view the earwig will usually dig another cell for them. This is sometimes done even in rotten wood, a task requiring several days.

The mother earwigs remain in the cell with the nymphs for most of their first stadium. Whether she carries food to them or feeds them by some other means during this period, I was unable to discover. Certainly she does not leave the cell for any extended foraging trips. Crumb (p. 39) states that both mother and young were found to have full stomachs at this time, but does not offer any suggestion as to how this food was secured.

If the nymphs be deprived of their mother directly after hatching, they can fend for themselves, at least if food is readily available. In such cases they leave their cell almost at once and scatter. If the

adult be replaced, she reconstructs the cell and gathers them together again.

FURTHER REMARKS ON OVA—Very moist conditions are necessary for the survival of eggs and young nymphs. The ova soon shrivel if deprived of moisture, but as a rule they will be deserted by their parents before this occurs. Even adult earwigs require moisture frequently. If kept in a dry place and not given succulent food, they will drink freely on gaining access to water.

The nesting of earwigs in paper, as described by Beall (p. 30), was likely due to overcrowding, as suggested in the preceding section. I have noticed that very little success attends the efforts of those females which are forced to nest in cages crowded with earwigs not concerned with brooding. The eggs in these cases are usually eaten, either by the other inmates of the cage, or by their own parents. The last mentioned habit is commented on both by Crumb (p. 39) and Beall (p. 32).

EFFECT OF TEMPERATURE ON THE DEVELOPMENT OF NYMPHS—My earwigs were raised in an unheated building, in which no doubt, temperatures more closely approached those of the natural environment than do those in a laboratory. In no case which I was able to check, was the duration of an instar less than 14 days. There was a distinct inclination for those nymphs which did not transform after 14 days, to continue in the same instar for 27 days. Stadia which were prolonged beyond this point, presumably because of low temperature, might continue for a very long period. Eventually, however, difficulty was experienced in casting off the exuviae. It is doubtful whether these individuals would ever survive under natural conditions.

One nymph I raised, remained in the fourth instar for a period of about 75 days, when it finally died without having moulted again. In another case the fourth instar lasted 62 days. This insect attained the adult stage but its wings were rumpled; it did not survive the winter.

A few nymphs can easily be found even at the end of summer. Whether these are a very late, possibly a third, brood, or whether they are the result of retarded moulting, as in the examples noted, I can not say. Six nymphs were taken in the field on September 12, in the second and third instars. They were not closely watched, but their cage was examined early in the following February: three were found alive, all fully developed. These, it may be assumed, reached the adult stage soon after being imprisoned.

At Tofino, on the West Coast of Vancouver Island, I found a few earwigs in several stages of growth, late in November. The youngest of these, still in the first instar, I kept alive. It attempted to transform the next day, but could not free the exuviae from its head, and shortly died. This nymph had not been in my possession long enough to suffer from unnatural conditions, such as may have affected the others under my observation.

SECOND BROOD — Female earwigs taken during May produced, in nearly every case, a batch of ova during the first half of June. Doubtless this was in most cases their second laying. The improbability, as shown above, of any examples of *F. auricularia* passing the winter in an immature state, makes it difficult to account otherwise for oviposition taking place so late.

A few female earwigs which I kept under careful observation after finding them with their first brood, all produced a second. Beall (p. 29-30), and Crumb (p. 35) mention the occurrence of second broods, but Crumb, at least, thinks that they are produced by only a small percentage of females. Possibly a dry climate would tend to prevent oviposition later in the spring.

In one case I was able to keep watch on a particular female for several months. This insect was taken May 1 in the act of copulation. Oviposition took place on May 29, and the nymphs appeared on June 19. The adult was then placed again with a male, and mating was observed on June 29. The second batch of ova was deposited July 20, but unfortunately failed to hatch.

As will be noted, the breeding of this

individual was somewhat out of season. Her first brood presumably was produced a little earlier than the usual time for the second. This fact suggests that it may have been her second brood, but definite proof is lacking.

Certainly if a third brood is ever produced it must be only in exceptional cases. A few females that I kept after they had hatched their second did not oviposit again, although some lived for a considerable time. None died before mid-July. Deaths occurred at various times up to the end of November, and one insect survived until the following April. Males are less long lived, none of mine survived until the end of July.

Beal[1] (p. 30) assumes that both batches of eggs are rendered fertile by copulation prior to the first oviposition. Crumb (p. 35 and 41), states that the males leave the hibernation cells in January, perhaps under compulsion from their mates. I have not been able, however, to find any evidence in support of these theories.

The males are active earlier than the females, but usually do not leave their cells for some weeks after their mates have oviposited. They can easily be found, either in the cells with females, many of which have eggs, or hiding nearby. In one case I am nearly certain copulation was taking place in a cell containing ova. Unfortunately the insects moved before I could check closely. However, no attempt was made by the female to drive out her mate. Under these circumstances I see no reason why fertilization should not take place while the females are attending their first brood.

HIBERNATION—The hibernating of earwigs in this climate could perhaps be better described as a period of comparative inactivity. They seem never to become completely dormant. Those which I kept in jars were perhaps protected from the frost a little better than those under natural conditions. Caged earwigs did not even bother to construct cells in which to hide, until early January, when they were nearly ready to oviposit. On any nights when the temperature was above 40° F., they could be seen crawling around, but they fed very little if at all.

Although the cover provided was far from ideal according to Crumb's data (p. 36), very few of my adult earwigs died during the winter. The jars mostly contained an inch or so of pure sand, well moistened. In one I used fairly fine sawdust instead, but the earwigs had difficulty in constructing cells in this medium.

Under natural conditions earwigs seem to prefer as winter quarters, cells dug under partially embedded stones. I found a great many in cells under loose bark of rotting logs, and when the wood was very soft, some distance into the log itself. The fact that all these were alive and busy with oviposition when discovered during February, goes to show that they found the latter location quite suitable. On the other hand some were found dead on January 8 under loose bark on a cedar log.

Two females kept alone since September 23, and two others since December 20, passed the winter safely, and three of them, including the two former, produced fertile ova. This observation is at variance with the findings of Crumb (p. 37) who concluded that the females seldom pass the winter alive without the company of a male. Admittedly I used very few insects in my experiment but a survival of four out of four is suggestive.

FOOD—Very wide differences of opinion exist among authorities as to what constitutes the chief food of the European earwig. No doubt food preferences vary from place to place, and even among individual colonies living in close proximity. For these reasons I expect that the list of food plants following will meet with some criticism, though I have checked with several residents in this district and all agree with my conclusions.

It was not possible for me to make use of dissection in order to study the food habits of earwigs. A good deal can be accomplished, when the insects are kept in small containers, by offering them various foods and watching to see which are most

readily accepted. Also earwig damage in the field can be readily recognized. Careful examination of places near which they congregate yields much information.

It does not appear to me that European earwigs are particularly adaptable to changes of food. In fact, they appear, when caged, to have a somewhat restricted diet, and can easily be starved into cannibalism, by depriving them of the plants they require. However, most common herbaceous plants will be eaten under compulsion.

Of garden vegetables, carrots and beets are the hardest to raise in earwig infested land. Legumes, potatoes, and rhubarb come in for much attention. Wild plants related to these vegetables were readily eaten by the insects. Cabbage is less susceptible and lettuce seems never to be harmed. Although wild Cruciferae and Compositae were eaten when the earwigs were not allowed other food, I could never find evidence of damage to these weeds in the field. Colonies of earwigs living on waste land seem to feed almost entirely on the narrow leaved plantain *(Plantago lanceolata)* though they also feed to some extent on clover.

Very few native trees and shrubs are attacked with the exception of Cascara *(Rhamnus purshiana)* of which they are very fond. In cases where maple and willow leaves are eaten there is usually some evidence that circumstances forced the earwigs to take to this diet. I found first instar nymphs to be fairly adaptable, but they never seem to lose their preference for the plants previously listed.

As regards animal food, earwigs eat readily any sort of dead animal matter. They seldom, if ever, kill insects, except those that are very sluggish and do not possess a hard or leathery covering. The fact that they often refuse to kill such easy game as termites and small smooth caterpillars, indicates habits very far from predatory.

I always found earwigs ready to accept crushed insects, or insect ova. Often such offerings were eaten at once, while I still held in my hand the jar containing the earwigs. I have seen them do the same with pieces of potato, after they had been starved in an attempt to make them take unfamiliar food. But ordinarily they would never eat vegetable food before nightfall.

INJURY TO GARDENS—Under this heading I have put together a few remarks which may prove of some help to garden owners troubled by earwigs.

Mature breeding insects do not seem to do much harm. Experiments went to show that during this stage they feed little and show an increased preference for animal food. Most of the damage is done by nymphs, and the chief sufferers are newly sprouted seedlings. Often so many of these are destroyed before they can get a start, that the results are mistaken for poor germination of seeds. Earwig damage, however, is readily recognizable, due to the fact that they first eat those seedlings nearest to the cover which they use during the day. This also gives a good clue to the place where the culprits can be found.

The nymphs travel only a very short distance from their hideout. For this reason much more trouble is experienced where cover, suitable for hibernation and oviposition, and for concealment of developing nymphs, is available to them. Rockeries could well be named "Earwig Hotels". Nothing suits the breeding adults and the first instar nymphs so well as a pile of stones and soil. Shubbery, bushes, and probably concrete walks are also used. Nymphs in the later stages and non breeding adults much prefer to be off the ground, except where the surface is very dry. At this time they are found under loose bark, in cracks in fences, and such places.

Seeds sown late in the season are very liable to suffer damage. Earwigs much prefer very young plants, and even if they are of a species not usually attacked, will turn their attention to them at a time when most other herbage has made considerable growth.

LOCAL ABUNDANCE OF THE WASPS CHLORION ATRATUM AND MEGASTIZUS UNICINTUS (Hymenoptera: Sphecidae and Bembicinae)[1]

HUGH B. LEECH
Dominion Forest Insect Laboratory, Vernon, B.C.

On August 22, 1945, a small box containing live wasps was received from Frank Choveaux of Okanagan Landing, B.C. It contained two species, one a black bembicid with an orange-red band across the abdomen, the other a blackish sphecid. These were subsequently identified by G. S. Walley as *Megastizus unicinctus* (Say) and *Chlorion (Prionony x) atratum* (Le-Peletier), respectively.

According to an interesting account of the habits of these species by H. E. Smith (1915. The grasshopper outbreak in New Mexico during the summer of 1913. U.S. Dept. Agric. Bul. No. 293, 12 p., 2 figs.), *C. (P.) atratum* is an important grasshopper parasite, stocking its nests with nymphs. Many of the burrows are re-opened by *M. unicinctus* females, which destroy the *Chlorions'* eggs and replace them with their own. Despite extensive outberaks of hoppers in British Columbia, there is no record of the wasps occurring here in numbers.

Mr. Choveaux reported hundreds of the wasps to be congregated on heads of grain and grasses each night, and he wondered if they might damage the seeds. That evening we visited the area concerned, a field about 3 miles from Vernon, just below the upper Landing road and west of its junction with the Commonage road. Grasshoppers were abundant; 1945 was the third successive year of an outbreak of *Melanoplus mexicanus mexicanus* (Sassure) (det. I. J. Ward). Mr. Chouveaux said that though the blue *Chlorion* was present but rare in previous years, the *Megastizus* had not been on his farm before.

A few strips of tall grasses had been left when the seed crops were cut, and on the tops of these grasses black clusters of the wasps could be seen from a distance of several hundred yards. They were in groups of from six to twenty, mostly on the seed heads, but extending for some distance down the upper stem. At 7:30 p.m. they were quiet, and easily captured. When picked up in the fingers the male *Megastizus* gave a most realistic show of stinging; the long spikes of the trident at the end of the abdomen were extruded, and the center one pressed against my skin strongly enough to be felt—and what was worse, it looked just like a sting. The simulated attack was psychologically effective and I found it hard not to drop the insect hurriedly.

The wasps were often in mixed lots, though in any one group each species showed a preference for its kind, e.g., where *M. unicinctus* were present they usually made up at least 75% of the total on that grass head. However, in all, the *Chlorion* outnumbered the *Megastizus* by nearly three to one. Of several hundred *Megastizus* examined, all were males. Only a single female was present in a random sample of 230 C. *atratum*: this despite the lateness of the season, shown by the fact that the wings of many of the *Chlorion* were faded and had ragged edges. Indeed on September 5, by which time the wasps were scarce, the proportion of the two species was still nearly three to one, and again all *Megastizus* were males and only a few *Chlorion* females were found.

I did not discover where the females of the two species spend their nights. They were not on the ground or under stones and trash; neither were they roosting on grasses or bushes within a quarter of a mile of where the males congregated. Perhaps the heavy clay in the field was unsuited for burrows, and the actual nesting site was in lighter soil some distance from the roosting grounds. A few male wasps were seen in tall weeds along the fence line and roadside bordering the field, but no other roosting ground was visible.

1 Contribution No. 2417, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

CURRENT TREND OF THE WESTERN HEMLOCK LOOPER (LAMBDINA F. LUGUBROSA) IN THE COASTAL FORESTS OF BRITISH COLUMBIA (Lepidoptera, Geometridae) [1]

H. A. Richmond
Dominion Forest Insect Laboratory, Victoria, B.C.

An outbreak of the western hemlock looper *(Lambdina fiscellaria lugubrosa Hlst.)* reached serious proportions in sections of the coastal forests of British Columbia during 1945. Only in that year was damage of this present cycle particularly noticeable and as indicated below there was little evidence of any degree of natural control. Further destruction of timber is expected during 1946.

This current outbreak represents the first appearance of the looper since the large outbreak of 1930. Although records of this insect date back to 1882 (de Gryse, 1934:523-527) it is only in recent years that specific data have been recorded on the prevalence of this insect in British Columbia. While these records are not necessarily complete, they indicate past outbreaks as follows: Stanley Park 1911-13 (Swaine, 1918); Vancouver Island 1913-14 (Jaenicke, 1929); Quatsino Sound, Vancouver Island 1925 (recounted by residents); south coastal mainland 1928-30 (Hopping, 1934: 12-13); and in the Interior, the Big Bend of the Columbia River and Nakusp region 1937-38 (unpublished records).

The last coastal outbreak subsided in 1930, but records of the occurrence of the hemlock looper have been obtained each year since 1937, the year of the inauguration of the Forest Insect Survey in British Columbia.

The present cycle first came into prominence in 1944, when the looper appeared in moderate numbers in the Lens Creek valley (upper San Juan drainage) although it was undoubtedly increasing in other areas where severe defoliation occurred in 1945.

During 1945 the major infestation occurred on the south west portion of Vancouver Island extending roughly from San Juan River north to the Alberni Inlet, an area of some 900 square miles. Throughout this region severe defoliation was irregularly distributed as is typical of looper attack. Viewed from the air in March 1946, some 140 square miles of timber appeared to be almost totally stripped of foliage. The timber concerned is some of the best of the west coast hemlock and Douglas fir. The most widespread infestation occurred in the Caycuse River valley, where extremely heavy defoliation extended from the mouth of the river on Lake Nitinat to its headwaters at McClure Lake and through to the headwaters of Walbran Creek. From the Caycuse it swept into the Nitinat valley where 400 million feet of timber are infested. North of the Nitinat an infestation as serious as that in the Caycuse valley, is centred in the Klanawa River valley, and covers some 12 square miles. Further infestations occur in the Pachena valley (moderate), lower Sarita (very severe), and at Coleman Creek (heavy). Endemic looper populations were recorded at the headwaters of the San Juan River, Lens Creek, Port San Juan, and Carmanah Creek. On the mainland further attack was reported from Clowhom Lake near Sechelt Inlet and in two areas on the Greater Vancouver watershed.

Current Looper Situation.—Present indications point to a very marked increase in looper population in 1946 on the basis of overwintering egg counts. In such examinations, four areas were considered, the Caycuse valley, Nitinat valley, Pachena and Coleman Creek. While the past history of these infestations is not definite, Pachena alone appears to be of

[1] Contribution No. 2442, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

1945 origin, the others are probably two years old. Egg population data were obtained through the examination of moss samples, taken from tree trunks at 20 foot intervals from ground level to the top. Old egg shells were recorded as well as sound eggs from which a ratio was obtained between remaining egg chorions of previous years, and the overwintering eggs of the current year. While there is no suggestion that such a ratio indicates the true increase for 1946, it is of interest in a relative sense in comparing one area with another. Defoliation figures were derived by examination of 1/5 acre plots adjacent to trees analyzed for egg counts. A summary of these averages follows:

aged 82% with an egg count of 226 sound eggs per square foot of moss at 80 feet elevation. At 1400 feet mean defoliation was 10% with 0.3 eggs per square foot of moss. The lack of a direct correlation between absolute elevation and looper abundance, however, eliminates any hard and fast rule in sampling a stand for mean defoliation.

There appears, furthermore, a marked variation in population according to light intensity. Dominant trees averaged 10% higher defoliation than intermediate trees and there was consistently greater feeding and more eggs in trees near forest openings adjacent to streams and swamps.

TABLE I.—Defoliation and Eggs in Moss, Western Hemlock Looper.

AREA	Per Cent Defoliation of Hemlock	AV. EGGS PER SQ. FOOT MOSS Old Chorions	Current Eggs	Ratio Between Old & Current Eggs
Caycuse	62	12.0	96.0	1: 8.0
Nitinat	51	7.5	95.2	1:12.7
Pachena	47	5.1	55.0	1:10.8
Coleman Cr.	81	22.0	96.0	1: 4.4

These figues represent conditions only at the points sampled and defoliation percentages should not be considered as typical of the entire area. There is a suggestion of a fairly serious situation for 1946, since it is felt that these indications are in no way an exaggeration of the overall picture. Nevertheless, such calculations cannot be regarded as more than approximations without extensive and adequate sampling, considering relative elevations, forest density and light intensity.

In estimating populations, the absolute elevation may not be as important as the relative height in a valley system. Thus the floor of the upper Caycuse valley, 750 feet elevation, was as severely defoliated as that of the Nitinat at 80 feet. In higher tributary valleys this characteristic was still evident in the severe attack in the gullies of small streams. That elevations are of minor importance, however, is not suggested, since in the Nitinat where 20 sampling points were selected with 92 moss samples examined, defoliation aver-

NATURAL CONTROL.—Records obtained from the Caycuse valley, the oldest apparent infested region in 1945, showed a larval parasitism of 5% and pupal parasitism somewhat less. No egg parasites were found in 1259 eggs incubated in January 1946. Of another 2000 eggs collected in March 1946, 93% hatched and no parasites were recorded. Neither de Gryse (1934) nor Watson (1934) reported parasites of primary importance in looper outbreaks in eastern Canada. Hopping (1934) recorded 14 species of parasites on the coast of British Columbia, but a high of only some 21% parasitism of larvae and pupae combined. He did, however, obtain 25% parasitism of eggs in the Seymour Arm region. In the light of the past records and in view of the trend suggested by current winter investigations, there appears to be little likelihood of any immediate slackening in the present hemlock looper situation. The eventual termination of the current cycle through the prevalence of disease is a

strong possibility, since there were minor indications of the appearance of disease in 1945. It is yet too early, however, to predict the trend of insect diseases and the future of this present outbreak of the hemlock looper.

LITERATURE CITED

de Gryse, J. J. and **K. Schedl**, 1934. An account of the eastern hemlock looper, **Ellopia fiscellaria** Gn., on hemlock, with notes on allied species. Sci. Agr. **14**:523-539.

Hopping, G. R. 1934. An account of the western hemlock looper, **Ellopia somniaria** Hulst., on conifers in British Columbia. Sci. Agr. **15**:12-29.

Juenicke, A. J. 1929. The western hemlock looper. Four L Lumber News 11:16-20.

Swaine, J. M. 1918. Insect injuries to forests in British Columbia, Chapter X, p. 220-37 in: Forests of British Columbia by H. N. Whitford and R. D. Craig, Commission of conservation, Ottawa.

Watson, E. B. 1934. An account of the eastern hemlock looper, **Ellopia fiscellaria** Gn., on balsam fir. Sci. Agr. **14**:669-678.

RESUME OF INFESTATIONS AND CONTROL OF THE COLORADO POTATO BEETLE IN BRITISH COLUMBIA, 1911-1946.

I. J. WARD
Provincial Entomologist, Vernon, B.C.

The potato beetle *(Leptinotarsa decemlineata* (Say) *)* was first recorded in British Columbia in 1911 at Newgate on the International Boundary in the extreme south-eastern portion of the Province. It appears that this infestation originated from the adjoining State of Montana.

No systematic eradication or control measures were adopted when the pest was first observed and the area of infestation grew considerably year by year. In 1922 E.C. Hunt, District Horticulturist, Nelson, B.C., and J. W. Eastham, Provincial Plant Pathologist, made a survey of the Newgate country and recommended that help be given to the growers. The following year control measures were adopted to a limited degree.

In 1926 the Dominion Entomological Branch in co-operation with the Provincial Department of Agriculture undertook to investigate the extent of the potato beetle infestation and to work out a systematic conrol program. The district then infested consisted of two areas:

(1) The larger area extended from Newgate north to Fernie and north-west through Cranbrook to Premier Lake in the Kootenay-Columbia Valley.

(2) The smaller area extended from Rykerts, B.C. on the International Boundary north to Creston and Wynndel.

It is believed that this infestation came to the Creston district, some sixty (airline) miles west of Newgate, from the State of Idaho to the south during 1923 or 1924.

The total area infested in the two districts amounted to approximately 665 square miles in which some 880 acres of potatoes were grown.

Supervised control measures were undertaken in 1927 and a total of 32,965 pounds of calcium arsenate 1-6 dust were used during the year. The late A. A. Dennys of the Dominion Division of Entomology was placed in charge. A reduction in the intensity of the infestation was noted. During the following year a spot infestation occurred 100 miles farther afield near Golden, B.C., in the upper Columbia Valley. This area was dusted thoroughly by Mr. Dennys and up until this year (1946) there has been no recurrence of the infestation.

In spite of improved and annual control, new infestations have occurred from time to time in isolated parts of southern British Columbia. In the early 1930's a spot in-

festation occurred in the Nelson area. Control work was undertaken by E. C. Hunt, the infestation was completely cleaned out and there has been no recurrence. During 1936 two infestations were reported at Grand Forks, B.C., on the International Boundary, and the pest spread considerably in 1937. The late M. H. Ruhmann, Provincial Entomologist, took charge of control in this area and after five years of thorough work the pest, so far as known, was completely eradicated.

In 1944 an area of infestation was found in the South Okanagan-Similkameen district just above the State of Washington. R. P. Murray of the British Columbia Horticultural staff, Penticton, carried out early control measures and a supervisor was appointed for control work in 1945 and 1946. A definite improvement in conditions has resulted.

The latest infestation in the Province occurred during 1946 in the Kootenay area between Trail and Nelson. Good control was obtained during the year and this area will be watched closely in 1947.

A check of a map will soon indicate that all infestations have originated close to the International Boundary. The neighboring states are known to be infested. It is not considered possible that the potato beetle will ever be eradicated from British Columbia, as frequent new infestations are almost certain to occur. There is every hope that the total area infested from year to year will be held to a minimum and important potato growing areas may be free of this pest for years to come. In recent years there has been no economic loss of potatoes due to the potato beetle.

British Columbia is broken up by high mountain ranges and river valleys. These serve as ideal barriers against the spread of the beetle and break up agricultural land into isolated areas. This has made it possible definitely to eradicate the pest from some areas.

New insecticides have provided improved control throughout the years. Supervised control has been carried out at a relatively low yearly cost and undoubtedly has prevented a much larger area of the Province from becoming infested.

The overall area of infestation during 1946 was less than in 1926. During 1926 a total of 33,000 pounds of poison dust was used in the East Kootenay district alone compared with less than 10,000 pounds in 1946 for the entire Province.

It is possible to check the records of this work done by the British Columbia Department of Agriculture for the past twenty years and to realize that the farmers have been spared a large annual expense and possible crop loss. This was accomplished for less than $5,000 yearly. If infestations had been ignored and the pest had become general the estimated annual control cost to the farmers would, by this time, have been well over $100,000 annually.

CALIFORNIA TORTOISE-SHELL BUTTERFLY IN BRITISH COLUMBIA, in 1945. (LEPIDOPTERA).—The California Tortoise-shell, **Nymphalis californica** Bdv., ranges throughout the Rocky mountains from sea level in southern British Columbia to California where it is more of a mountain species.

The year 1945 has been a favourable one for this notably erratic species. It occurred in large numbers in various parts of the Province where in previous years it was scarcely noticed.

John Sowerby of Tata Creek, some twenty miles north of Cranbrook, reports that during the last thirty years he has never seen them in such large numbers. They were also observed by the writer swarming about damp places along the roadside in Manning Park, about the second week in August. In the vicinity of Victoria, Vancouver Island, they were more numerous than any other species of butterfly. From time to time during the season, similar reports have come in from other sections of the Province.

A wood-pile affords an excellent hibernaculum. Throughout the cold weather several specimens were found snugly tucked between blocks of wood. One was seen flying across a busy street in Victoria on January 5, while another was disporting about a wood-pile on the 17th.

The larvae usually feed on **Ceanothus**, but sometimes they resort to alfalfa, manzanita and other shrubs.—George A. Hardy, Provincial Museum, Victoria, B.C.

TROPIDISCHIA XANTHOSTOMA FROM TOFINO, B.C. (Orthoptera: Stenopelmatidae).—During December, 1945 I took a specimen of the cave cricket **Tropidischia xanthostoma** (Scudder) at Tofino on the West Coast of Vancouver Island. E. R. Buckell, who identified the insect, advises me that this is the first record from the West Coast of the Island, and that the specimen is immature. It was found in a subterranean wooden drain used to carry off rainwater from a house. —Richard Guppy, Wellington, B.C.

COMMERCIAL APPLICATION OF PHENOTHIAZINE FOR CODLING MOTH [1] CONTROL.

R. P. MURRAY [2]
Department of Agriculture, Penticton, B.C.

Although phenothiazine had been used experimentally since 1934, not until 1945 was it applied on a commercial scale for codling moth control either in British Columbia or elsewhere as far as can be learned. Experimental work undertaken at Kelowna in 1937 by Ben Hoy[3], District Field Inspector of Kelowna and continued by him and the Dominion Entomological Laboratory staff[4] until 1944 produced very encouraging results.

In working with phenothiazine they found that the ordinary commercial grade used as an anthelmintic was not sufficiently toxic for codling moth control. When micronized, however, it was highly effective. In fact micronized phenothiazine proved to be about five times as effective as either lead arsenate or cryolite. They also found that if applied late in the season, either as late first brood cover sprays or second brood sprays phenothiazine interfered with normal coloration of red varieties of apples. Furthermore, if applied during hot weather it was capable of causing quite serious skin burning on the spray men. Since the material is not wetted by water it is necessary first to wet it with oil, then to disperse the oil-wetted phenothiazine in water by means of a substance such as casein-lime spreader. Because ordinary summer oil resulted in a heavy deposit that could not be removed, stove oil was used as the wetting agent.

As a result of this work the writer in 1945 undertook to test the value of micronized phenothiazine on a commercial basis at Penticton, B.C. Four orchards that were heavily infested by codling moth in 1944 received early first brood sprays of three-fourths pound micronized phenothiazine per hundred gallons wetted by one quart of stove oil which, in turn, was emulsified by approximately two ounces of casein-lime spreader. About 50 acres were involved and approximately 1,300 pounds of micronized phenothiazine used in the treatment. Each orchard received a calyx spray of either cryolite or lead arsenate, and first, second and third cover sprays of micronized phenothiazine. The fourth and fifth cover sprays were of cryolite-casein-lime and second brood applications were either of fixed nicotine or cryolite-casein-lime. With the exception of one property which was improperly sprayed the orchards showed marked improvement in codling moth control. Results are summarized herewith:

Orchard	1944 Infestation Per Cent	1945 Infestation Per Cent
No. 1	60	4.3
No. 2	50	8
No.3	No record, but only portion of crop picked, due to coddling moth infestation.	12
No. 4	28	24

Because 1945 was a year during which infestation in the Okanagan Valley as a whole showed general increase in spite of the heaviest spraying on record, these results are gratifying. It is anticipated that upwards of fifteen tons of micronized phenothiazine will be used for codling moth control in British Columbia during 1946.

[1] Carpocapsa pomonella L.

[2] District Field Inspector, British Columbia Department of Agriculture, Penticton, B.C.

[3] Hoy, Ben, 1943. Phenothiazine as a codling moth insecticide. Ent. Soc. Brit. Columbia, Proc. 40:11-12.

[4] Marshall, J., 1945. Phenothiazine in codling moth control. Scientific Agriculture 25 (9):543-550.

LOCALITY LABELS.—Excellent labels in 3½ or 4 point type, may be obtained from The Nature Company, P.O. Box 403, Covinton, La., U.S.A. Two, 3 or 4-line white labels, all the same: 45c for 500; 70c for 1,000, and 45c for each additional thousand.

PRESIDENTIAL ADDRESS

J. R. J. LLEWELLYN JONES, M.A., F.R.E.S.
Cobble Hill, B.C.

Again it is my privilege to welcome the members of the Entomological Society of British Columbia, this time to their 45th Annual Meeting.

It is a desirable feature to hold our meetings on occasion at varying points in the Province, and it should help to diffuse a better understanding of our Society's work and activities, many of which, in the economic sphere in particular, are of value to the agriculturist, the horticulturist, the fruitgrower and those dependent on forestry for their living. It also gives an opportunity for members who would otherwise be unable to attend through difficulties of travel and other causes, to be present when the meeting is held near their home town, or place of employment. Hence the choice of Lytton this year, being, as it is, a reasonably easy journey both from the coastal areas and the interior of the Province.

Since we last met, world events have moved very swiftly and we now find ourselves in a period of transition from a world war to an era of peace, with its visions of great opportunities and progress, but also, let us not forget, beset with its attendant difficulties and problems. As touching our Society we look forward to a period of expansion both in membership and activities.

MEMBERSHIP—In the name of the Society I welcome all those, whose names have been put forward for nomination, and who will shortly, in due course of procedure, be elected members.

The Society extends a cordial welcome to the men and women of the services on their return to civil life and the resumption of normal activities and invites any interested in the ways and habits of insects to become members, and so give us and the Province as a whole the benefit of their discoveries, knowledge and ability.

Our universities and colleges are full to overflowing and among these many students there are some who no doubt are interested in entomological research. We should not overlook nor ignore these potential entomologists, but make them feel welcome in our midst and give encouragement to them in their work.

Young people especially react favourably when interest is shown by those of us who are older and presumably therefore possessed of greater learning and wisdom. Sound advice and constructive criticism, given in a kindly way, are valuable in helping the inexperienced student, whereas destructive criticism merely blasts earnest endeavour. With so many returned men and women in our colleges this would seem an opportune time to offer a small prize, perhaps a book or something of that nature, to be awarded to a deserving student who shows promise of distinguished achievement in entomological research. By so doing the Society would be showing in a practical way its interest in the students of our Province.

ACTIVITIES—As to the Society's activities, now that peace time conditions lie ahead, equal stress should be laid upon work of a purely scientific value as upon economic research. However it is only to be expected that the latter will seem of greater importance to many, especially the general public.

There is a wide scope in both fields. On the purely scientific side, more information would be welcome on such subjects as hybridization, the causes which contribute to colour variation in species, the reasons for gynandromorphic specimens and whether this can be produced artificially, the diseases of insects, their causes and cure, if any, and many other kindred subjects. For those interested in taxonomy the compiling and revision of check lists, lists of host plants and of the geographical distribution of species, are but a few examples of much needed work. On the economic side, further experiments in the use of in-

secticides, such as the powerful DDT are urgently required. Decisions will have to be made in the light of available data as to the advisability of wholesale and unrestricted use of any particular insecticide. The question to be decided is whether the advantages to be gained by an intensive application of powerful insecticide in any one area with the resultant death of all but a few species of insects may be outweighed by the destruction of many beneficial insects and the balance of nature upset.

To turn to another topic, interest is being shown in some quarters of the Province in the breeding for commercial purposes of the silk-worm *Bombyx mori* Linnaeus. Information as to the best methods of breeding the larvae would doubtless be welcome. Also in districts where its primary food plant the mulberry is scarce, information as to substitute food plants would be desirable. Currant and lettuce have been tried by some and the larvae have been known to feed on these plants and spin their cocoons. Lettuce, however, is liable to cause diarrhoea and is therefore not very satisfactory. Some of our members could perhaps furnish more information on the above lines.

There is another point which should not be overlooked, that of instructing the public. For the most part the average person is very ignorant about the ways and habits of insects. One common example will illustrate what I mean. About this time of the year, or even earlier, it is not uncommon to find references in the press to the early appearance of butterflies. The insect is frequently called "Amos," and certain deductions are made of a more or less erroneous nature. This year radio commentators have joined the press in mentioning the early appearance of butterflies, and deducing from such appearances an exceptionally early spring or specially favourable weather for some place or other. There may be an element of truth in all this, but the fact is overlooked that many species of butterflies such as Commas, Tortoise-shells, the Mourning Cloaks and possibly in suitable districts Red Admirals, hibernate during the winter months in such places as barns, outhouses, basements, wood piles and thick brush. Consequently on a mild and sunny day in winter or early spring they may frequently be seen taking an airing as if enjoying a brief spell of exercise in the sun's genial rays. There is no particular significance in this. It is quite a normal habit. On the other hand a report of the appearance of a non-hibernating species such as an Orange Tip, a Blue, or Cabbage White at a very early date would be of note and worthy of press or radio comment. Members of our Society could help to correct such misconceptions as the one now under review by giving accurate and interesting information from time to time about our insects, either by articles in the press, through information supplied to the schools, or in many other ways. Erroneous ideas should whenever possible be dispelled by someone competent to do so. One thing we should remember when addressing the public is to use language which they understand so that they will benefit by the information offered and we on our part will not be misunderstood and perhaps ridiculed. It is abundantly clear then that there is a wide choice of activity open to our members in the years that lie ahead.

FINANCES.—The finances of the Society show a distinct improvement. They show a credit balance of about $85.00. This is very largely due to the successful advertising campaign conducted by Messrs. Ivor Ward and Ralph Cudmore and the thanks of the Society are due to them for their efforts. The fears of those who thought that the general appearance of the PROCEEDINGS would be spoiled by the presence of advertisements seem quite unjustified.

It will be noted that the amount borrowed from the Reserve Endowment Fund has been recovered, but to replace this immediately would leave only a few dollars in the general account with which to carry on. It would be unwise to take any action which would leave the Secretary-Treasurer with no adequate funds with which to start the financial year. A similar result next year and the year following should show a satisfactory credit balance after all indebt-

edness to the Reserve Fund has been paid up. This fund is now a separate account into which all moneys earmarked for it will be paid in future.

Now a word as to the ultimate use of the Reserve Fund. It is desirable and necessary that this fund should be augmented so that the Society may have adequate and independent reserves with which to enlarge and improve the PROCEEDINGS and possibly to publish a quarterly journal and to restore the privilege granted by many contemporaries of 25 free copies of reprints. To be independent of any outside assistance for our publications is a very worth-while objective, and one which will give complete freedom to our editorial committee in its choice of material for publication. At the present time it is under obligation to give preference to economic papers.

However we ought not to stop at the mere provision of funds for our publications. As a learned Society we should do something to justify that claim. For example we should offer prizes and scholarships. It would be much to our credit, and probably to our advantage, if we were to start some such action in the immediate future. A small prize could be offered now and a larger one later on till we could see our way clear to provide a scholarship. Such a step seems eminently desirable. So again I commend this fund to your notice, sympathetic consideration and generous support and remind you of my previous remarks on this subject (Presidential Address, in 1944 PROCEEDINGS, 41:2).

LIBRARY.—A learned society should be in possession of a good library, and we are fortunate in having a very good nucleus upon which to build one. Unfortunately, however, little use is made of it at the present time chiefly because the books are scattered, some at the Parliament Buildings in Victoria and some at the office of the Dominion Plant Inspection Department in the Federal Building at Vancouver, and also because there is no adequate catalogue. The time appears to be ripe for some action which will make the library accessible and of real use to the members.

Probably a library committee should be appointed to go into the ways and means of bringing this about. The books should be collected in to some central place where they would be available to the greatest number of our members and should be of easy access; also a suitable catalogue should be compiled. It would be unwise, however, to authorize any action which would allow our library to become the property of some other institution as a price for getting it catalogued. Such action, if taken, would probably be regretted later. This question of cataloguing has been discussed before, and various methods have been described to us and we have been urged to choose one or other method. Do we need an elaborate form of catalogue? Ours is not a public library and our membership is not large. A simple and inexpensive catalogue would seem to be all that is necessary to supply the needs of the members. With these matters attended to, members might be encouraged to donate books to the library, or to direct in their wills that their libraries of entomological books become the Society's property. Books might also be purchased with a grant from the Society's funds from time to time to complete sets of such journals as the "Canadian Entomologist" and to obtain other desirable books.

ENTOMOLOGICAL SOCIETY OF CANADA.—A proposition emanating from the Entomological Society of Ontario. It suggests formation of an Entomological Society of Canada to speak and act in the name of Canadian entomologists as a whole. You have received copies of the proposals and I trust that you have given them careful consideration. Theoretically, the idea is eminently sound and is in many respects desirable, and is in keeping with the growing importance and prestige of the Dominion. But theories do not always work when put into actual practice, and it is therefore my duty to warn members not to make any hasty or unwise decisions upon this important matter. Under the scheme, our Society remains a branch of the new society, and it is assumed that all or at least the majority of our members will wish to join the new organization. It is very doubtful if this as-

sumption is justified. It is a matter for speculation as to whether the society will ever be anything more than one on paper. We are told that the existing societies and new ones, which it is hoped to form, will in fact constitute the new society. This is no doubt theoretically correct.

It is also questionable as to whether a truly representative number of members from each Province and district of Canada could attend the new society's meetings. This very difficulty has arisen on a smaller scale, with regard to our own society. At the Coast meetings there is usually a preponderance of Coast members present, and at meetings held in the interior of the Province the reverse prevails. There is therefore grave doubt as to whether we are justified in expecting anything very different in the case of a Dominion-wide society. Then there is the question of the status of our PROCEEDINGS under the new proposals. The proposals seem somewhat nebulous and in need of clarification. The matter calls for our careful and serious thought. However, we should take a broad-minded attitude towards the proposition and weigh the pros and cons very carefully and after having done this express our views clearly and unequivocably.

In Memoriam

WILLIAM ARTHUR DASHWOOD-JONES, 1858-1928

My father, the late William Arthur Dashwood-Jones, pioneer, and amateur entomologist and horticulturist, was born on March 25, 1858, at Kinson, Dorset, England, the only son of Captain W. A. Dashwood-Jones, Royal Artillery, and Mrs. Dashwood-Jones. He spent his childhood under the guardianship of his uncle at Upton House, Poole, Dorset. He was educated by private tutors and later went to Wimbourne Grammar school, and was in London at the University College school preparing for Cambridge, when, on the loss of his income, he decided to go to British Columbia. He left England in March, 1876, and arrived at Portland, Maine, where he took train for San Francisco, and came up the coast by boat to Victoria, landing there on April 26. He made his home at Nanaimo with his uncle, the late Archdeacon Mason, Rector of St. Paul's, later Rector of Christ Church Cathedral, Victoria and first Archdeacon of Vancouver.

Father spent some time in Nanaimo and Victoria, and ranched on Lasqueti Island and at Duncan. In 1878 he went to take charge of the Inverness cannery winter quarters on the Skeena River where he spent one winter alone but for one other white man. Leaving there he went to Yale before construction of the Canadian Pacific Railway, then returned to Victoria. He went then to Drynock, where he was attached the Resident Engineer's staff on construction of the railway. The camp had the honour of entertaining the Marquis of Lorne, Governor General of Canada, who came that far on his way to British Columbia. Father later went on to Spences

Bridge with the engineers and was with them till construction was ended. Under Onderdonk the contractor he became the first express messenger on the division which terminated at Port Moody. He stayed with this work till the Canadian Pacific Railway took over the road, and was their first express messenger on the run from Calgary to Port Moody, the end of the line.

He left the railroad in 1888 and came to New Westminster where he engaged in business, in the course of which he shipped the first salmon out of British Columbia over the Rockies. He left the business world to enter the Provincial Government service in 1894, joining the staff of the Land Registry Office and later becoming Deputy Assessor and Collector. After twenty years' service, he was superannuated in the early twenties.

During all those years he took a keen interest in horticulture and entomology. He organized the first Chrysanthemum Show in New Westminster about 1900. He was a director of the Royal Agriculture Society, and it was by his efforts the floral department became outstanding. As a boy he had been keenly interested in the out-doors and his hobbies then were birds' nesting and the collecting of wild flowers, butterflies and moths. At New Westminster he spent all his leisure hours in his garden or in pursuit of his entomological interests. He spoke the Chinook jargon fluently and often acted as interpreter in court.

The years of his retirement were spent in the enjoyment of his many interests. His garden brought visitors from all parts of the country. His big collection of butterflies, moths, etc., being too large to keep at home was kept at the Court House and it all went up in flames in the New Westminster fire. He never made such a large collection again and in later years gave most of the latter collection away to different schools and to the Westminster Club. I treasured four cases, but even with moth balls, I found it impossible to keep out pests, and they went the way of all things.

I think he was the most active in entomology during the first four years of the century. He was a charter member of the Entomological Society of British Columbia, and carried on a world-wide correspondence. Many collectors came out to New Westminster to see him, perhaps the most noted being Dr. Barnes of New York and Decatur, Ill., and the Hon. Charles Rothschild of London, England, the owner together with his brother the Hon. Walter Rothschild, of Tring Museum. To this museum which he had often visited as a boy, father sent many specimens. I have in my possession two volumes (author's copies) of "A Revision of the Lepidopterous Family Sphingidae" by the Hon. Walter Rothschild and Karl Jordan, sent to him by the authors. On page 614 of the larger volume of this work he is mentioned as having sent to the Tring Museum specimens of *Lepisesia ulalume* of which they wrote "a rare insect, of which we have not seen many specimens." These insects were caught on the blossoms of apples and white lilacs in my father's garden at 627 6th Avenue, New Westminster. When one considers the number of individuals and species of Sphingidae contained in the Tring Museum, at that time nearly 16,000 specimens belonging to some 660 species, *ulalume* was quite a catch and deserved the special mention it got.

Collectors wrote from all over the world for specimens. He sent many to the United States, and also to England and Eastern Canada. I might add that the only places in British Columbia where *ulalume* was reported by Tring Museum as being taken were Enderby, New Westminster and North Vancouver.

He died on October 8, 1928, from shock, three weeks after his elder son Laurence, a barrister at Vancouver, was killed by an automobile. The family home is still occupied by his youngest daughter, Mrs. E. G. Pearson at 627 6th Avenue, New Westminster, where the family has resided to date 52 years.

There were five children: Laurence, Victor (627 6th Ave., New Westminster), Edith (Mrs. M. M. Shore, Abbotsford, B.C.), Grace (Mrs. S. M. Green, 721

6th Ave., New Westminster), and Kathleen (Mrs. Pearson). Each has a son, i.e. Donald Dashwood-Jones, Edmund Dashwood-Jones, Kenneth Shore, Stanley Green and Ernest Pearson; three of them served in World War II. Victor, now Head Revenue Accountant in charge of all revenue of the British Columbia Electric Railway Company, Vancouver, as his father was, is greatly interested in entomological and botanical activities, and devotes all his spare time to these hobbies, at his country home, "Seven Oakes," on the south side of the Fraser River in Surrey Municipality.

—GRACE MELVILLE GREEN

THEODORE ALBERT MOILLIET, 1883-1935

My father, Theodore Albert Moilliet, was born at Cheyney Court, Herefordshire, England, May 11, 1883, and was educated at Felsted School, Essex. He died at Kamloops, B.C., on December 21, 1935.

Although his father was fairly well-to-do, Tam, being the youngest of five brothers, had to depend largely on his own resources. When he left school it was a toss-up whether he would go to the South African War or to Canada. He decided in favor of farming in Canada, where he arrived in 1899. At first he was a pupil at a farm near Orillia, Ont. He claimed that he worked harder there than at any time since, and learned how not to farm!

Leaving Ontario, he threshed grain in Saskatchewan until the weather became too cold, then worked his way west until he reached Trail, B.C. Here he was employed at the Smelter and became very interested in the work but fell ill with a combination of pneumonia and lead and mercury poisoning. Upon leaving the hospital he was advised to lead an out-door life. He worked on several ranches, including W. C. Ricardo's and Price Ellison's near Vernon, and Bostock's at Monte Creek. Then one day, he told me, he was sitting on a hill south of Kamloops, looking up the North Thompson River; the sight of the little known river gripped his imagination and he determined to explore it and possibly take up land.

That fall he and his uncle, Hyde Finley, went with a survey party timber cruising as far as Tete Jaune Cache. He first staked land at Cottonwood Flats, a large natural meadow just below Hellsgate. The hay they put up floated away in an unseasonable September flood. They realized there was no controlling the river, or mosquitoes, so moved down to what is now Vavenby, to a high clay bench some 300 feet above the river. This turned out to be too dry and with too little irrigation water to be developed. In 1908 he moved to the south bank of the Thompson where there were several fine creeks with good land adjacent, and pre-empted three quarter-sections. At this time Tam was joined by his brother Jack, and a store was started, there being an influx of settlers, prospectors, trappers, etc., and rumours of a railway. As it was nearly 50 miles by river

or pack trail to Chuchua, the head of the wagon road from Kamloops, my father became an expert with canoe, raft and pack horse. He had several narrow escapes on the river and on one occasion was reported drowned when an Indian found his raft overturned. After Jack's death in the war (1915) the store was carried on by Mr. Finley until sold in 1925.

In 1909 he married Mary T. Stephens who came out from England. I was born the same year, my sister Madeline in 1911, and my brother John in 1919. In 1912-13 the Canadian Northern Railway was put through and our first 50 sheep were driven in over road, right-of-way, and trail from Louis Creek. In 1915, 500 more sheep were obtained from Lacombe in Alberta. Owing to inexperience, lack of good help, ravages by diseases, wood ticks and coyotes, my father was nearly ruined. However, by sheer determination he stuck to sheep and was fortunate in getting as a partner a skilled American shepherd Hiley Ladow. They were among the first in British Columbia to run sheep on the high ranges. They grazed on McCorvie Mountain (later called Mt. McLennan) at an elevation of 4,000 to 4,500 feet from 1917-22, and on Foghorn Range, south of Birch Island, at altitudes between 5,000 and 7,000 feet, from 1923 on.

It was about 1918, and partly to interest me, that my father returned to collecting Lepidoptera, a hobby of which he had been fond as a boy. He joined the Entomological Society of British Columbia in 1921. Before that he contacted E. H. Blackmore of Victoria, who agreed to set and name us a complete series of all species we sent him. A long and interesting correspondence between the two men resulted, and they became great friends though they never met, and Blackmore's premature death was keenly felt by us. We collected fairly extensively during the period 1919-24, after which I went away to school. As Blackmore was chiefly interested in "micros" we concentrated on them. There was great excitement when my father turned in a series of a minute pink creature which Blackmore at first glance took to be a new Order, but after much research, it was discovered to be an already known Fulgorid. I think we found only two species new to science, *Euphi moillieti* Blackmore and *Epinotia scorn* Blackmore, but a number of others such a *Hemaris thysbe* form *cimbiciformis* Steph *Basilarchia arthemis* Dru., and a certain Blue, and many others were considered remarkable either for their numbers or their range. It was noticed that some forms previously known only from the Arctic were found around timberline.

Our collection is still at Vavenby. Blackmore kept what specimens he needed, and that material is presumably still in his collection, most of which is now at the University of British Columbia.

I have mentioned the difficulties with wood ticks. So far as I know ours were among the first livestock losses from tick paralysis in the Province and led E. A. Bruce and Seymour Hadwen, then of Agassiz, to undertake a study of the situation. As early as 1930 a virulent form of of the tick-borne disease tularaemia was isolated from *Haemaphysalis leporis palustris* Banks, taken from a dying rabbit by my father and forwarded by the late Eric Hearle for testing in Montana.

A man of strong personality and physique, my father always took a keen interest in community life. He helped to organize the Upper North Thompson Farmers' Institute in 1916, and was Secretary of it and its successor, the Upper North Thompson Live Stock Association, until his death. He was Secretary of the local School Board from its beginning in 191 until his death in 1935. In 1913 he and his brother started making meteorological observations, and the weather records have been kept here ever since. He even started a Debating Society in the early 20's, but it did not survive a discussion on the respective merits of "Cattle Ranching versus Sheep Ranching." There has always been much antagonism between the two interests, but my father succeeded in getting what range he wanted. Since the grazing land was being ruined by the growth of brush, he became one of the British Col

umbia sheep industry's principal proponents of the idea of improving range land by burning. This ended in a battle with the Forest Branch owing to their obdurate position on the subject. On principle, during the last few years of his life he refused to pay grazing fees to the Crown, which he contended was fast allowing the range to become overgrown and useless.

A great conversationalist and an avid reader, my father wrote many an interesting and many a strong letter. It is worthy of note that his liking for biology may have stemmed partly from his knowledge that he was directly descended from the marriage of Francis Galton's brother with Charles Darwin's sister. Incidentally, my mother is related to George Crotch who did some of the earliest insect collecting on the coast of British Columbia.

He is survived by two older brothers and a sister in England; his widow and his uncle Mr. H. Finley, both of Aveley Ranch, Vavenby; two sons, John and myself (who are carrying on the business of sheep ranching at Vavenby); and his daughter, now Mrs. E. A. Rendell of Vernon, B.C. There are five grandchildren.

—T. K. MOILLIET,
Vavenby, B.C.

HARRY CANE, 1860-1935

Harry Cane was born in Slinfold, Yorkshire, England, on September 30th, 1860, the son of Henry Cane, architect, and Louisa Cane (a direct descendant of Sir Christopher Wren). He received his early education in England.

In 1877, his father, having been appointed to superintend the building of a palace for the Maharajah of Cooch Behar, young Harry accompanied his parents to India. There he studied architecture under his father and assisted him later in the designing and construction of the Normal School at Cooch Behar. During his stay in India he painted several beautiful landscapes, and made a fine collection of butterflies which he presented to a friend in England on his return there in 1888.

In 1892 he came to the United States and spent a few years in Oregon before coming to Nelson, B.C., where he was connected with a firm of local architects. He again utilized his spare time in making up a moth and butterfly collection, now owned by H. R. Foxlee of Robson, B.C. Though not complete, the collection gives an idea of the many varieties to be found in the Nelson district.

For many years his activities were curtailed by failing sight, but until his death in 1935, his cheerful courage, in the face of this handicap, was an inspiration to all with whom he came in contact. Always a lover of the beautiful, he found great pleasure in sketching and painting, and many of his watercolours are now prized possessions of various friends throughout the Kootenay district of British Columbia.

* * *

The above was written by Mrs. Gordon Allan of 1115 Ward Street, Nelson, from data supplied by Mrs. Harry Cane and from her own knowledge as a friend of the family.

Mr. Cane's collection was made I believe in the last decade of the last century

and the early years of the present one. The insects are well mounted, though low on the pins, in the English style; a few have faded badly. There are about 600 specimens, representing 220 species, a goodly number considering that he caught them all in the confines of his own garden. Fifteen or sixteen of the species I have not yet seen from other parts of the Nelson district.—H. R. FOXLEE.

DYSLOBUS LUTEUS AS A PEST OF RASPBERRY (Coleoptera: Curculionidae).—In the summer of 1906 (date unknown) my attention was called to the ragged condition of the leaves in a patch of cultivated raspberries. The damage was distinctive and did not resemble that usually caused by lepidopterous larvae. Injured leaves had a series of long narrow areas, extending from the margin to the midrib, entirely removed; the intervening portions of the leaf blade were quite undamaged. There were usually three or four of these injured areas on each side of the mid-rib thus producing a very uniform type of damage. It was confined to the large leaves near the bases of the canes.

No cause for the injury being apparent, it was concluded that the insect responsible had deserted the plants. However, a visit after dark with the stable lantern revealed numbers of the weevils feeding on the foliage, which in some cases was quite weighted down by them. During the day they could be found hidden beneath the surface soil and under the dead leaves around the crowns of the canes. A specimen was recently identified as **Dysiobus luteus** (Horn) by Peter C. Ting, who is making a revisional study of the species of this genus. A similar type of leaf injury has been observed from time to time in raspberry plantations throughout the valley. It is probable that this beetle is quite generally distributed, although owing to its nocturnal habits it has escaped detection and avoided punishment.—E. P. Venables, Vernon, B.C.

HYDATICUS MODESTUS AT CRESTON, B.C. (Coleoptera: Dytiscidae).—In the summer of 1945 I reported to H. B. Leech the capture of several **Hydaticus modestus** Sharp at Creston, B.C. He replied that he knew of only 7 other British Columbia specimens—from 6 different localities. Mine were taken in a pond of clear water left by the rampant spring floods of the Goat River, with gravel bottom, no vegetation and only a sprinkling of small drift wood. The pond was exploited throughout the season (Aug. 12-Sept. 18), with a catch of 38 specimens. Males predominated and 3 of the females were of the immaculate phase.—G. Stace Smith, Creston, B.C.

BUPRESTIS CONFLUENTA IN BRITISH COLUMBIA (Coleoptera, Buprestidae).—**Buprestis confluenta** Say has a wide distribution in North America, being reported from British Columbia to Ontario and from California to Indiana. W. J. Chamberlin (Buprestidae of North America, 1926: 107) cites **Populus tremuloides** as its host tree.

Two specimens of this species, rare in British Columbia, have been received at the Provincial Museum in recent years. One example, taken at Lac la Hache, by George Forbes on July 18, 1943, near a stand of **Populus tremuloides** and **P. trichocarpa**, apparently constitutes the most northern record for the Province; the second specimen was collected by the writer in Manning Park, between Hope and Princeton, on August 15, 1945, as it was resting on an old fir log by the roadside near a growth of **P. trichocarpa**.

G. R. Hopping informs me that he has two specimens from Midday Valley, one from Aspen Grove and one from Nicola Lake, while G. Stace Smith reports that he has taken two individuals at Creston, on or near **P. trichocarpa**.

H. B. Leech has taken the species at Salmon Arm while I understand that G. J. Spencer has additiopal records.

From the available facts this species seems to be partial to the fairly dry interior plateau region of the Province.—George A. Hardy, Provincial Museum, Victoria, B.C.

A NOTE ON THE ANT CRICKET MYRMECOPHILA OREGONENSIS (Orthoptera: Gryllidae).—On December 30, 1945, I found in a cell under loose bark on a fir log, what was evidently a new colony of carpenter ants, **Camponotus** Sp. It consisted of a queen, four small workers, and a clump of very young larvae.

The interesting point is that along with these was a small, perhaps nymphal, ant cricket, **Myrecophila oregonensis** Bruner. This seems to indicate a remarkable instinct, inherent in these crickets, of attaching themselves to ant colonies at a very early stage in their formation.

I cut this log into stove wood and there was no established colony of ants therein. One other colony, more advanced in that the workers numbered possibly one hundred, was found a few feet away. I could find no crickets with these.—Richard Guppy, Wellington, B.C.

BIBLIOGRAPHY OF BIOGRAPHIES OF ENTOMOLOGISTS. By Mathilde Carpenter. American Midland Naturalist, 33 (1):1-116. January, 1945. For sale by the A.M.N., Notre Dame, Indiana, price $1.20.—The author considers her paper to be a sort of second edition, enlarged and up to date, of J. S. Wade's BIBLIOGRAPHY OF ENTOMOLOGISTS, WITH SPECIAL REFERENCE TO NORTH AMERICAN WORKERS (1928. Ann. Ent. Soc. Amer. 21 (3):489-520). Certainly it is enlarged, not only as to the number of persons listed, but also by the number of references per name. In addition it includes all entomologists of all countries and is intended to be complete through 1943. The method of citing volume and page is as in the example above. The given names when known, the years of birth and death are included for each person but all other data must of course be obtained from the references cited.—H. B. L.

The Proceedings of the Entomological Society of British Columbia is published annually. Individual volumes may be had for 50c. Special rates on sets. Address Secretary, Entomological Society of British Columbia, Box 308, Vernon, B.C.

Progressing for Agriculture...

In the rapidly expanding field of Agricultural Chemicals C-I-L is endeavouring to do the best job possible. While fertilizers still hold an important place of their own, new chemicals for use in Agriculture now have become so important a part of our work that the name of FERTILIZER DIVISION has been changed to AGRICULTURAL CHEMICALS DIVISION. It is the aim of this division of C-I-L to give the greatest possible service not only in fertilizers, but also in fungicides, insecticides, herbicides and all other allied chemicals for use in Agriculture.

New Chemicals to the Fore...

FUNGICIDES	**"Deenate 50W"—DDT—dichloro-diphenyl-trichloroethane**
	"Gammexane"—666—benzine hexachloride
HERBICIDES	**"Fermate"—Ferric dimethyldithio-carbamate**
	"Zerlate"—Zinc dimethyldithio-carbamate
INSECTICIDES	**"Herbate"—2, 4-D—2, 4-dichloro-phenoxyacetic acid**
RODENTICIDES	**"Rodant"—ANTU—alpha-naphthyl-thiourea**

These and many others are being deevloped by scientific research to combat—more efficiently and econically —those insects, diseases and weeds which cost agriculture millions of dollars annually, and cut down the production of vitally needed foodstuffs.

C-I-L are making these new chemicals available, and through out Technical Staff and sales organization we are striving to extend our every facility to the betterment of Canadian Agriculture.

"Serving Agriculture with Chemistry"

CANADIAN INDUSTRIES C-I-L LIMITED

CANADIAN INDUSTRIES LIMITED

Agricultural Chemicals Division

NEW WESTMINSTER, B.C.

Loveliness from Health
Just radiating happiness, this B.C. Apple Girl owes much of her loveliness to the sheer joy of living, for like her grandmothers before her, she follows the old rule for keeping the doctor away!
Not alone because they are healthful & nutritious but because of their fine texture, fresh crispness and delicious flavour, B.C. Apples are favourites everywhere.
For real satisfaction insist on B.C. Apples . . . buy in small quantities . . . and serve them crisp & cool from your refrigerator.
B.C. TREE FRUITS LTD.
B.C. APPLES
HEAD OFFICE
KELOWNA
BRITISH COLUMBIA

BRINGING THE LATEST DEVELOPMENTS IN AGRICULTURAL CHEMICALS:

BENZENE HEXACHLORIDE
DN 111
DN DRI MIX No. 1
DN DRI MIX No. 2
D-DUST-50 (50% wettable DDT)
D-DUST-3 (3% DDT Dust)

COMMERCIAL CHEMICALS LIMITED

Pier H, foot of Carrall St., Vancouver, B.C.

ANSELL LABORATORIES LTD.

VERNON, B.C.

Manufacturers and Distributors of

Chemical Products

INSECTICIDES CLEANING COMPOUNDS

Special Mixing

11 VARIETIES

TASTE GOOD • SAVE TIME •
NO WASTE • EASY TO PACK •
READY FOR USE AT ANY TIME

BULMANS LIMITED, VERNON, B.C.

BULMANS

FANCY QUALITY *dehydrated* VEGETABLES

NICHOLS CHEMICAL

offers

A Complete Line of DDT Products

Including Advanced and Exclusive Formulations—
For All Established Horticultural Applications

NICHOLS' DDT products—as all its agricultural chemicals—are the result of thorough going research and close, practical association with growers' needs. Into their development has gone all of the skill, science and experience gained in producing Orchard Brand insecticides and fungicides for Canadian agriculture.

Ask about

GENITOX DDT PRODUCTS

GENITOX S50—50% DDT Wettable Spray Powder.

GENICOP 3-6 DUST—A DDT-Neutral Copper (combined Insecticide-Fungicide) Dust containing 3% DDT and 6% Metallic Copper.

GENICOP SPRAY POWDER—Highly concentrated DDT Insecticide — Neutral Copper Fungicide for Spraying.

●

For full information, contact nearest Nichols Chemical Sales and Technical Service Office.

CHEMICALS NICHOLS FOR CANADA

The NICHOLS CHEMICAL COMPANY, Limited

MONTREAL • TORONTO • VANCOUVER...Executive Offices, Sun Life Bldg., Montreal

Insecticide Division

Check

THE OUTSTANDING RESULTS

given this YEAR by these

Green Cross* Modern PEST CONTROL PRODUCTS

Entomologists and Farmers throughout Canada have given generous praise to the high quality and performance of Green Cross Products—Here are a few that have been outstanding:—

For the Orchards

Mulsoid Micronized* Wettable Sulphur—Dinitrosol*—Spralastic* Spreader-Sticker—Oil Type Stop-Drop*

On Potatoes

50% Micronized* DDT Wettable Powder—14% DDT Basi-Cop* Spray Powder—3% DDT Basi-Cop* Dust

On Vegetables and Flowers

NNOR* Rotenone Spray—Garden Guard* Rotenone Dust—DDT Flower Spray—Basi-Cop*—Daylite* Dust—Tomato Dust

For Weed Control

WEED-NO-MORE, the only product containing the butyl ester of 2-4, D

For General Pest Control

50% DDT Powder for Barn & Livestock Spray—5% DDT Residual Household Spray—Green Cross Animal Insect Powder—Pyradee* Insect Powder and others.

GREEN CROSS FIELD LEADER PRODUCTS

Manufactured in Canada by:

*Reg'd trademark

THE CANADA PAINT CO. LIMITED
THE LOWE BROTHERS COMPANY LIMITED
THE MARTIN-SENOUR CO. LIMITED
THE SHERWIN-WILLIAMS CO. OF CANADA LIMITED

To Correct

BORON DEFICIENCIES

Use 20 MULE TEAM BORAX

OR

BORIC ACID

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops. The work and recommendations of Agricultural Experiment Stations are steadily increasing the recognition of the need for Boron in Agriculture and Horticulture. We are prepared to render every practical assistance.

PACIFIC COAST BORAX COMPANY

P. O. BOX 5539, METROPOLITAN STATION, LOS ANGELES 55, CALIFORNIA

Distributed by

MACDONALD & WILSON LIMITED

562 Beatty Street **Vancouver, B.C.**

Contributing to Production

With a full line of

CANADIAN, ENGLISH AND AMERICAN

Insecticides and Fungicides

including

Bulman's Go-West Weevil Bait	**Naugatuck 2, 4-D**
Boots Coppesan	**DDT 5% Surface Spray**
Black Leaf "40"	**DDT 10% Dust**
Black Leaf "155"	**Spergon Seed Treatment**
Bartlett's Microscopic Sulphur	**DDT 50% Wettable**
Atlacide Weed Killer	**Beta Naphthol Tree Bands**

BUCKERFIELD'S LIMITED

P.O. Box 219 Vancouver, B.C.